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(54) METHOD AND DEVICE FOR PRODUCING LOW FLAME PROPAGATION CIGARETTE

(57) Provided are a method and an apparatus for manufacturing a burn spread suppressing cigarette which does not scorch a combustible material heavily at all or not scorch the combustible material heavily even if it scorch the material while the cigarette is burned and is left on the combustible material, because the burn of the cigarette is ceased by a burn control agent or, the hear of burn controlled by the agent is spread into the material. The burn spread suppressing cigarette manufacturing apparatus includes a unit (30, 30') which forms burn control agent coated regions on a web (20a) of a wrapping paper transferred by a wrapping paper transfer unit (18) at a plurality of positions, which are apart from each other in the longitudinal direction or in the width direction of the web, a unit (14) which supplies chopped tobacco leaves to the wrapping paper after formation of the burn control agent coated regions, a roll-up unit (23) which rolls up the wrapping paper (20a, 20a') on which the chopped tobacco leaves are supplied, and a cigarette cutting unit (28) which cuts the rolled-up wrapping paper together with the chopped tobacco leaves in a predetermined length of the cigarette in the longitudinal direction thereof.

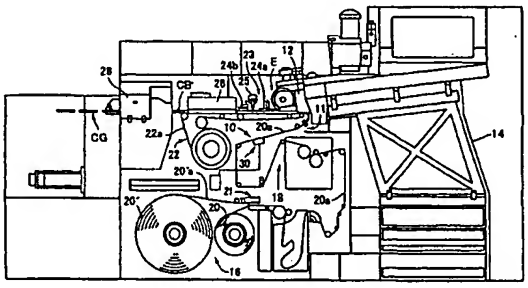

FIG. 1

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Description

Technical Field

[0001] The present invention relates to a method of manufacturing a cigarette which suppresses a spread of burn and an apparatus for manufacturing a cigarette which suppresses a spread of burn.

Background Art

[0002] A cigarette which suppresses a spread of burn is a cigarette structured such that, if it is left not to be smoked after it is lighted, the lighted cigarette ceases to burn, or a cigarette structured such that, if it is erroneously dropped onto a combustible material while the cigarette is left not to be smoked after it is lighted and the lighted cigarette continues to burn, the heat of the burning cigarette is spread into the the combustible material and the burning cigarette case to burn before it burns the combustible material. The cigarette which suppresses the spread of burn has been well known by, for example, Japanese Patent No. 2783803.

[0003] In the burn spread suppressing cigarette, which is disclosed in the Japanese Patent specification described above, burn control agent is coated on a tobacco wrapping paper sheet at a plurality of annular regions positioned apart from each other by a predetermined distance in a longitudinal direction of the cigarette. If the burn spread suppressing cigarette is left not to be smoked after an end of the cigarette to be lighted is lighted, the burn of the cigarette is extinguished when the burn of the cigarette reaches the annular region of the burn control agent. On the other hand, if the cigarette is smoked continuously after it is lighted, the burn of the cigarette is not extinguished by the burn control agent even when the burn reaches the annular region of the burn control agent.

[0004] In the conventional burn spread suppressing cigarette which is structured as described above, an ordinary burn like in an ordinary cigarette is maintained between the adjacent annular regions of the burn control agent. Therefore, if the conventional burn spread suppressing cigarette is erroneously left on a combustible material and burns ordinarily between the adjacent annular regions of the burn control agent, it does not burn the combustible material but it severely scorches the combustible material depending on a kind of the combustible material, before the burn reaches the annular region of the burn control agent and is extinguished by the burn control agent.

[0005] This invention is derived from above described circumstances, an object of the present invention is to provide a method of manufacturing a cigarette which suppresses a spread of burn and an apparatus for manufacturing a cigarette which suppresses a spread of burn, in the cigarette manufactured by this method or this apparatus, when the lighted cigarette is erroneously left on a combustible material, burn of the cigarette is cased, heat of the burning cigarette is spread into a combustible material and does not only burn but also scorch the combustible material, or even if the heat of the burn scorches the combustible material the scorch does not become more severe than in the past.

Disclosure of Invention

[0006] In order to achieve the object of the present invention described above, a method of manufacturing a burn spread suppressing cigarette, according to the present invention, comprises:

a wrapping paper transfer step which transfers a wrapping paper for a cigarette;
a burn control agent coated region forming step which forms a burn control agent coated region on the wrapping paper transferred in the wrapping paper transfer step;
a chopped tobacco leaf supply step which supplies chopped tobacco leaves to the wrapping paper on which the burn control agent coated regions is formed in the burn control agent coated region forming step;
a roll-up step which rolls up the wrapping paper on which the chopped tobacco leaves are supplied in the chopped tobacco leaf supply step, together with the chopped tobacco leaves; and
a cigarette cutting step which cuts the rolled-up wrapping paper rolled up, together with the chopped tobacco leaves, in the roll-up step to correspond to the longitudinal length of the cigarette.

[0007] In the burn spread suppressing cigarette manufactured by the method manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the above described structure, it is possible to set freely a time required for the lighted cigarette to be ceased after the lighted cigarette is left, and to set freely a burn temperature even if the lighted cigarette is not ceased and continue to burn, by controlling a width of the burn control agent coated region and the number of forming of the burn control agent coated region.

[0008] As a result of this, even if the burn spread suppressing cigarette is erroneously left on a combustible material and burns ordinarily, the burn of the cigarette is ceased by the burn control agent or heat of the burn is spread into the combustible material without burn of the combustible material so that the burning cigarette does not scorch the combustible material or, even if the material is scorched, the scorch does not more severe than in the prior art.

[0009] Needless to say, in the method of manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, the wrapping paper transferred in the

wrapping paper transfer step is a long web before it is cut for individual cigarettes. And, it is possible to form accurately the burn control agent coated region in a desired pattern, in the desired number and in a desired density by forming the burn control agent coated region in the burn control agent coated region forming step while the long web-like wrapping paper is transferred in the wrapping paper transfer step.

[0010] In the method of manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, it is desirable that, in the burn control agent coated region forming step, a formation of the burn control agent coated region is performed in synchronism with a cutting operation of the rolled-up wrapping paper in the cigarette cutting step.

[0011] It is desirable for the method of manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, that the method further comprises a burn control agent coated region inspecting step between the burn control agent coated region forming step and the chopped tobacco leaf supplying step, the inspecting step inspecting a distribution (including a pattern and the number) and density of the burn control agent coated region formed on the wrapping paper in the burn control agent coated region forming step.

[0012] The burn control agent coated region can be formed accurately in a desired pattern, in the desired number and in a desired density by forming the burn control agent coated region on the wrapping paper of the long web transferred in the wrapping paper transfer step, in the burn control agent coated region forming step. And, in the inspecting step, the distribution (including the pattern and the number) and density of the burn control agent coated region formed as described above can be inspected accurately.

[0013] In this case, in the burn control agent coated region inspecting step, a light is projected on one surface of the wrapping paper for the cigarette after formation of the burn control agent coated region, the light transmitted through the wrapping paper for the cigarette is detected in a side of the other surface of the wrapping paper after formation of the burn control agent coated region, and the distribution and density of the burn control agent coated region formed on the wrapping paper is inspected on a basis of intensity distribution of the transmitted light.

[0014] In the method of manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, it is desirable that the burn control agent coated region is formed on a surface of the wrapping paper, the surface becoming an inner surface when the wrapping paper is rolled up for a cigarette, in the burn control agent coated region forming step.

[0015] As a result of this, an outer appearance of the burn spread suppressing cigarette looks like that of the conventional cigarette, a possibility of damaging the burn control agent coated region formed on the wrapping paper for some reasons during storage of the cigarette becomes low remarkably.

[0016] In the method of manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, a plurality of burn control agent bands may be formed to extend in a direction which becomes a longitudinal direction when the wrapping paper is rolled up for a cigarette, in the burn control agent coated region forming step.

[0017] In the method of manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, it is desirable that a plurality of bands of the burn control agent are formed to extend intermittently in the direction which becomes the longitudinal direction when the wrapping paper is rolled up for a cigarette, with a predetermined gap in the longitudinal direction, in the burn control agent coated region forming step.

[0018] The predetermined gap noted above can be in correspond to the longitudinal length of the individual cigarette. In this case, it is desirable that the burn control agent coated region is not formed on a portion of the wrapping paper, the portion of the wrapping paper becoming a head of the cigarette when the wrapping paper is rolled up to the cigarette, and the head having a predetermined length in the longitudinal direction of the cigarette.

[0019] This results from that the cigarette is rarely left immediately after the head of the cigarette is lighted, and a lightening of the head of the burn spread suppressing cigarette will not be rendered poor.

[0020] According to experiments conducted by the inventors of this invention, it is desirable that the predetermined length is set within a range between about 10 mm and about 25 mm.

[0021] Further, since the transfer direction of the wrapping paper in the wrapping paper transfer step is a direction in which becomes a longitudinal direction when the wrapping paper is rolled up for a cigarette, it is desirable that, in the burn control agent coated region forming step, a roller is in contact with the wrapping paper transferred in the wrapping paper transfer step and is rotated in the transfer direction, a burn control agent coated region transfer area corresponding to the burn control agent coated region is formed on the outer circumferential surface of the roller, and the burn control agent supplied form a burn control agent applying device is applied to the outer circumferential surface of the roller by the burn control agent applying device.

[0022] Where the burn control agent coated region forming step uses the roller, the width and the diameter (i.e., the circumferential length of the outer circumferential surface) of the roller can be change easily. Therefore, the burn control agent coated region transfer area formed on the outer circumferential surface of the roller

can be changed easily.

[0023] Alternatively, in the burn control agent coated region forming step, a nozzle member can be in contact with or is positioned close to the wrapping paper transferred in the wrapping paper transfer step, a plurality of nozzle holes can be formed in the nozzle member, and the burn control agent can be supplied from a burn control agent supply device to the nozzle member.

[0024] When the burn control agent coated region forming step uses the nozzle member provided with a plurality of nozzle holes, the timing at which the nozzle holes of the nozzle member eject the burn control agent can be changed easily. As a result of this, in a case that the plurality of bands of the burn control agent are formed intermittently with the predetermined gap in the direction which becomes the longitudinal direction when the wrapping paper is rolled up for a cigarette, in the burn control agent coated region forming step, the longitudinal length of the predetermined gap can be changed easily, compared with in the case that the burn control agent coated region forming step uses the roller noted above.

[0025] In order to achieve the prescribed object of the present invention, an apparatus for manufacturing a burn spread suppressing cigarette according to the present invention, comprises:

a wrapping paper transfer unit which transfers a wrapping paper for a cigarette;
a burn control agent coated region forming unit which forms a burn control agent coated region on the wrapping paper transferred by the wrapping paper transfer unit;
a chopped tobacco leaf supply unit which supplies chopped tobacco leaves to the wrapping paper on which the burn control agent coated region is formed by the burn control agent coated region forming unit;
a roll-up unit which rolls up the wrapping paper on which the chopped tobacco leaves are supplied from the chopped tobacco leaf supplying unit, together with the chopped tobacco leaves to form a cigarette; and
a cigarette cutting unit which cuts the rolled up wrapping paper, which is rolled up together with the chopped tobacco leaves by the roll-up unit for a cigarette, in a predetermined longitudinal length of the cigarette.

[0026] That is, the apparatus for manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, manufactures a burn spread suppressing cigarette by the method of manufacturing a burn spread suppressing cigarette characterized by the above described structure, so that the cigarette manufactured by the manufacturing apparatus of the present invention can enjoy all technical advantages that can be obtained by the cigarette manufactured by the method of manufacturing a burn spread suppressing cigarette according to the present invention.

[0027] Needless to say, in the apparatus for manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, the wrapping paper transferred by the wrapping paper transfer unit is a long web before the wrapping paper is cut into individual cigarettes.

[0028] In the apparatus for manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, it is desirable that the burn control agent coated region forming unit forms the burn control agent coated region on the wrapping paper in synchronism with a cutting operation of the rolled-up wrapping paper performed by the cigarette cutting unit.

[0029] In the apparatus for manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, it is desirable that the manufacturing apparatus further comprises a burn control agent coated region inspecting unit which inspects a distribution (including the pattern and the number) and density of the burn control agent coated region formed on the wrapping paper after formation of the burn control agent coated region on the wrapping paper by the burn control agent coated region forming unit and before supply of the chopped tobacco leaves performed by the chopped tobacco leaf supply unit.

[0030] The burn control agent coated region can be formed accurately in a desired pattern, in the desired number and in a desired density by forming the burn control agent coated region on the wrapping paper of the long web transferred by the wrapping paper transfer unit, by the burn control agent coated region forming unit. And, the inspecting unit can inspect accurately the distribution (including the pattern and the number) and density of the burn control agent coated region formed as described above.

[0031] In this case, the burn control agent coated region inspecting unit can project a light on one surface of the wrapping paper for a cigarette after formation of the burn control agent coated region, can detect the light transmitted through the wrapping paper for the cigarette in a side of the other surface of the wrapping paper sheet after formation of the burn control agent coated region, and can inspect the distribution and density of the burn control agent coated region formed on the wrapping paper on a basis of intensity distribution of the transmitted light.

[0032] In the apparatus for manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, it is desirable that the burn control agent coated region forming unit is arranged to be in contact with the wrapping paper transferred by the wrapping paper transfer unit, and comprises a wrapping paper shift

unit which selectively shifts the wrapping paper transferred by the wrapping paper transfer unit to be brought into contact with the burn control agent coated region forming unit.

[0033] In this case, it is desirable that the wrapping paper shift unit shifts the wrapping paper to separate from the burn control agent coated region forming unit while the transfer of the wrapping paper by the wrapping paper transfer unit is stopped.

[0034] In the apparatus for manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, it is desirable that the burn control agent coated region forming unit forms the burn control agent coated region on that surface of the wrapping paper which becomes an inner surface when the wrapping paper is rolled up for a cigarette.

[0035] As a result of this, an outer appearance of the burn spread suppressing cigarette looks like that of the conventional cigarette, and a possibility of damaging the burn control agent coated region formed on the wrapping paper for some reasons during storage of the cigarette becomes low remarkably.

[0036] In the apparatus for manufacturing a burn spread suppressing cigarette and characterized by the structure as described above, the burn control agent coated region forming unit can form a plurality of bands of the burn control agent to extend in a direction which becomes a longitudinal direction with the wrapping paper is rolled up for a cigarette.

[0037] In the apparatus for manufacturing a burn spread suppressing cigarette according to the present invention and characterized by the structure as described above, the burn control agent coated region forming unit can form a plurality of bands of the burn control agent to extend intermittently in the direction which becomes the longitudinal direction when the wrapping paper is rolled up for a cigarette, with a predetermined gap in the longitudinal direction.

[0038] The predetermined gap noted above can be in correspond to the longitudinal length for the individual cigarette. In this case, it is desirable that the burn control agent coated region is not formed on a position of the wrapping paper, the portion of the wrapping paper becoming a head of the cigarette when the wrapping paper is rolled up to the cigarette, and the head having a predetermined length in the longitudinal direction of the cigarette.

[0039] This results from that the cigarette is rarely left immediately after the head of the cigarette is lighted, and a lightening of the head of the burn spread suppressing cigarette will not be rendered poor.

[0040] According to experiments conducted by the inventor of the present invention, it is desirable that the predetermined length is set within a range between about 10 mm and about 25 mm.

[0041] Further, since the transfer direction of the wrapping paper is a direction which becomes a longitudinal direction when the wrapping paper is rolled up for a cigarette, it is possible that the burn control agent coated region forming unit includes a roller that is in contact with the wrapping paper transferred by the wrapping paper transfer unit and is rotated in the transfer direction of the wrapping paper, a burn control agent coated region transfer area corresponding to the burn control agent coated region and formed on the outer circumferential surface of the roller, and a burn control agent applying device which supplies the burn control agent onto the outer circumferential surface of the roller and applies the burn control agent to the outer circumferential surface of the roller.

[0042] Alternatively, the burn control agent coated region forming unit includes a nozzle member which is in contact with or is positioned close to the wrapping paper transferred by the wrapping paper transfer unit, a plurality of nozzle holes formed in the nozzle member, and a burn control agent supply device which supplies the burn control agent to the nozzle member.

[0043] Where the burn control agent coated region forming unit uses the roller, the width and the diameter (i.e., the circumferential length of the outer circumferential surface) of the roller can be change easily. Therefore, the burn control agent coated region transfer area formed on the outer circumferential surface of the roller can be changed easily.

[0044] Where the burn control agent coated region forming unit uses the nozzle member noted above, the timing at which the nozzle holes of the nozzle member eject the burn control agent can be changed easily. As a result of this, in a case that a plurality of bands of the burn control agent are formed intermittently with the predetermined gap in the direction which becomes the longitudinal direction when the wrapping paper is rolled up for a cigarette, by the burn control agent coated region forming unit, the longitudinal length of the predetermined gap can be changed easily, compared within the case that the burn control agent coated region forming unit uses the roller noted above.

[0045] In following descriptions, an apparatus for manufacturing a cigarette which suppresses a spread of burn, by a manufacturing method of the burn spread suppressing cigarette, the method being according to one embodiment of the present invention, together with various modifications of the manufacturing apparatus, will be explained in detail with reference to accompanying drawings.

Brief Description of Drawings

[0046]

FIG. 1 schematically shows an entire structure of an apparatus for manufacturing a cigarette which suppresses a spread of burn, the apparatus manufacturing the cigarette by a method of manufacturing the burn spread suppressing cigarette, the

method according to one embodiment of the present invention, and the apparatus including a device which inspects a cigarette wrapping paper used for the burn spread suppressing cigarette;

FIG. 2 is an enlarged view showing an unit, together with various members and mechanisms near around the unit, which forms burn control agent coated regions on the cigarette wrapping paper, the unit having a novel structure and included in the apparatus for manufacturing the burn spread suppressing cigarette shown in FIG. 1;

FIG. 3A is a side view showing in an enlarged fashion a roller and a burn control agent applying device, both of which are included in the burn control agent coated region forming unit shown in FIG. 2, and a long web of the wrapping paper transferred by a wrapping paper transfer unit;

FIG. 3B is a front view showing the roller, the burn control agent applying device and the web, these shown in FIG. 3A;

FIGS. 4A, 4B, 4C and 4D show various examples of a plurality of bands of the burn control agent formed on one surface of the long web of a wrapping paper by the burn control agent coated region forming unit shown in FIG. 2 while the wrapping paper is transferred by the wrapping paper transfer unit, the bands of the burn control agent being burn control agent coated regions formed by various burn control agent coated region transfer areas on the outer circumferential surface of the roller of the burn control agent coated region forming unit;

FIG. 4E is a perspective view showing the burn spread suppressing cigarette with a chip paper of a filter being cut to open, the cigarette being manufactured by the burn spread suppressing cigarette manufacturing apparatus shown in FIG. 1 and using the long web of the wrapping paper shown in FIG. 4D;

FIG. 5 is an enlarged view showing a modification of the burn control agent coated region forming unit included in the burn spread suppressing cigarette manufacturing apparatus shown in FIG. 1, together with various members and mechanisms near around the unit;

FIG. 6A is an enlarged side view showing a nozzle member of a modification of the burn control agent coated region forming unit;

FIG. 6B is a front view of the nozzle member shown in FIG. 6A;

FIG. 6C is a view showing an end surface of a wrapping paper facing portion of the nozzle member as viewed in a direction exactly opposite to that for the side view shown in FIG. 6A;

FIG. 7 schematically shows in an enlarged fashion the inspecting unit which inspects a cigarette wrapping paper for a burn spread suppressing cigarette and which is included in the apparatus for manufacturing a burn spread suppressing cigarette shown in FIG. 1, together with a unit which discard a defective article;

FIG. 8A is a plan view schematically showing how the cigarette wrapping paper inspecting unit shown in FIG. 7 inspects a plurality of bands of a burn control agent, which are formed on the long web of the wrapping paper transferred by the wrapping paper transfer unit shown in FIG. 1, the band being the burn control agent coated region formed by the apparatus for manufacturing a burn spread suppressing cigarette shown in FIG. 1;

FIG. 8B shows results of detection performed as shown in FIG. 8A by the inspecting unit which inspects the wrapping paper for a burn spread suppressing cigarette;

FIG. 9 shows results of various inspections that can be performed by the cigarette wrapping paper inspecting unit shown in FIG. 7;

FIG. 10A is an enlarged oblique view schematically showing another example of a burn spread suppressing cigarette which can be manufactured by the apparatus for manufacturing a burn spread suppressing cigarette of the present invention; and

FIG. 10B is an enlarged oblique view schematically showing still another example of a burn spread suppressing cigarette which can be manufactured by the apparatus for manufacturing a burn spread suppressing cigarette of the present invention.

Best Mode for Carrying Out the Invention

[0047] At first, with reference to FIG. 1, an entire structure of a cigarette manufacturing apparatus for manufacturing a cigarette which suppresses a spread of burn will be described schematically, the apparatus manufacturing the burn spread suppressing cigarette by a method of manufacturing the burn spread suppressing cigarette and, the method according to one embodiment of the present invention.

[0048] A structure of the apparatus for manufacturing a burn spread suppressing cigarette shown in FIG. 1 is equal to a structure of a conventional cigarette manufacturing apparatus with excepting a cigarette wrapping paper manufacturing device 10 and a cigarette wrapping paper inspecting unit 11. The device 10 is used for manufacturing a cigarette wrapping paper suppressing a spread of burn, and the unit 11 is used for inspecting the cigarette wrapping paper suppressing a spread of burn.

[0049] The burn spread suppressing cigarette manufacturing apparatus shown in FIG. 1 comprises an air permeable transfer unit 12 which transfers chopped tobacco leaves. The chopped tobacco leaf transfer unit 12 uses an air permeable transfer belt. A passageway member 14 which is used for supplying chopped tobacco leaves extends from a chopped tobacco leaf supply source (not shown) to the chopped tobacco leaf transfer unit 12. The chopped tobacco leaves are transferred by

an air stream from the chopped tobacco leaf supply source (not shown) to the chopped tobacco leaf transfer unit 12 through the chopped tobacco leaf supply passageway member 14.

[0050] The chopped tobacco leaves supplied from the chopped tobacco leaf supply source are pressed on the chopped tobacco leaf transfer unit 12 at an end of the chopped tobacco leaf supply passageway member 14 by the air stream and forms a slender band having a predetermined width and extending along a center line in the transfer direction (longitudinal direction) of the chopped tobacco leaf transfer unit 2.

[0051] An end of a main portion of a wrapping paper transfer unit 18 which transfers a cigarette wrapping paper from a cigarette wrapping paper supply source 16 is positioned at another end E of the chopped tobacco leaf transfer unit 12 in the transfer direction. In this embodiment, a roll 20 of a long web which is used as a raw material of the cigarette wrapping paper and from which a cigarette wrapping paper sheet for an individual cigarette is cut is rotatably arranged in the wrapping paper supply source 16, and the long web 20a withdrawn from the roll 20 by the main portion of the wrapping paper transfer unit 18 is transferred to the above described end of the main portion of the unit 18 via a slackening preventing mechanism.

[0052] In this embodiment, the main portion of the wrapping paper transfer unit 18 includes a large number of pairs of tension rollers, pairs of guide rollers and pairs of driving rollers.

[0053] An additional roll 20' which is the same as the roll 20 is also arranged rotatable in the wrapping paper supply source 16. A starting end of a web 20'a of the additional roll 20' faces the long web 20a withdrawn from the roll 20 by the wrapping paper transfer unit 18, at an automatic joining machine 21. If a final end of the web 20a supplied from the roll 20 is detected by the automatic joining machine 21, the automatic joining machine 21 joins the starting end of the web 20'a of the additional roll 20' to the final end of the web 20a of the roll 20. As a result of this, the web 20'a of the additional roll 20' is transferred toward the above described end of the main portion of the wrapping paper transfer unit 18 in succession to the web 20a of the roll 20.

[0054] The wrapping paper transfer unit 18 has a wrapping paper supporting and transferring device 22 arranged in a downstream of the end of the main portion. In this embodiment, the wrapping paper supporting and transferring device 22 uses transfer belt 22a supported by a plurality of guide rollers and driving rollers, and the web 20a or 20'a coming from the end of the main portion is laid on an upper horizontal moving portion of the transfer belt 22a and is transferred by the transfer belt 22a.

[0055] A tongue shaped member (not shown) is arranged at the end E of the chopped tobacco leaf transfer unit 12 in the transfer direction, and the chopped tobacco leaves are led by the tongue shaped member at the end E onto the web 20a or 20'a on the upper horizontal moving portion of the transfer belt 22a. The transfer direction of the web 20a or 20'a by the upper horizontal moving portion of the transfer belt 22a is equal to the transfer direction of the chopped tobacco leaves transferred by the chopped tobacco leaf transfer unit 12, and the center line of the transfer direction of the chopped tobacco leaf transfer unit 12 corresponds in a vertical direction to the center line of the transfer direction of the upper horizontal moving portion of the transfer belt 22a. Therefore, the chopped tobacco leaves led by the tongue member from the end E of the chopped tobacco leaf transfer unit 12 in the transfer direction onto the web 20a or 20'a on the upper horizontal moving portion of the transfer belt 22a is deposited on the web 20a or 20'a to form a slender band extending along the center line of the transfer direction of the web 20a or 20'a.

[0056] A roll-up unit 23 is arranged along the upper horizontal moving portion of the transfer belt 22a. The roll-up unit 23 rolls the web 20a or 20'a on which the chopped tobacco leaves are deposited to form the slender band on the upper horizontal moving portion of the transfer belt 22a, up to the shape of a cigarette, i.e., in the form of a long cylinder, while the upper horizontal moving portion of the transfer belt 22a is advanced.

[0057] The roll-up unit 23 includes roll-up devices 24a, 24b, a paste applying device 25, and a paste drying device 26, and these devices are arranged along the transfer direction of the upper horizontal moving portion. The first roll-up device 24a stands both side portions of the web 20a or 20'a on which the chopped tobacco leaves are deposited to form a slender band on the upper horizontal moving portion, up to form a substantially U-shaped cross section and, then, curls one of the side portions to wrap the chopped tobacco leaves of the slender band. The paste applying device 25 applies a paste to the edge of another of the side portions of the web 20a or 20'a that still have been stood up. The second roll-up device 24b curls the remained stood side portion of the web 20a or 20'a, on the edge of which the paste has been applied, onto the edge of the curled side portion that has been curled tubular as described above to fix the edge of the secondary curled side portion to the edge of the firstly curled side portion with the paste. As a result of this, the web 20a or 20'a is formed into a long cylindrical rod CB with the chopped tobacco leaves being held therein.

[0058] The long rod CB is passed through the paste drying device 26 to dry the paste, and, then, the rod CB is cut into a plurality of cigarettes CG each having a predetermined length by a cutting unit 28 arranged close to the paste drying device 26.

[0059] That is, the transfer direction of the long web 20a or 20'a of the wrapping paper which is transferred by the wrapping paper transfer unit 18, is a longitudinal direction of the long web 20a or 20'a of the wrapping paper after the web 20a or 20'a is rolled up in the form of the long rod CB for cigarettes.

[0060] The above described structure of the appara-

tus for manufacturing a burn spread suppressing cigarette shown in FIG. 1, is the same as the structure of the conventional cigarette manufacturing apparatus.

[0061] The apparatus 10 for manufacturing a cigarette wrapping paper suppressing the spread of burn, has a novel structure in the burn spread suppressing cigarette manufacturing apparatus shown in FIG. 1, and comprises a unit 30 which forms a burn control agent coated region, the unit 30 being used in combination with the main portion of the wrapping paper transfer unit 18.

[0062] Next, the structure of the burn control agent coated region forming unit 30 will be described in detail with reference to FIG. 2 in addition to FIG. 1. In FIG. 2, the burn control agent coated region forming unit 30 of the manufacturing apparatus for manufacturing a burn spread suppressing cigarette shown in FIG. 1, is shown in an enlarged fashion together with various members and mechanisms near around the unit 30.

[0063] The burn control agent coated region forming unit 30 forms a burn control agent coated region in a desired pattern on a surface of the long web 20a or 20'a of the wrapping paper transferred by the main portion of the wrapping paper transfer unit 18, by applying a burn control agent for controlling a burn of the wrapping paper of the cigarette CG, the surface of the long web 20a or 20'a on which the burn control agent coated region is formed being located inside when the web 20a or 20'a is rolled up to make the long rod for cigarettes. In this embodiment, the burn control agent coated region forming unit 30 forms a plurality of burn control agent coated regions of a plurality of bands of a burn control agent on the surface of the web 20a or 20'a which will be located inside as described above, and these bands extend in the direction which will become a longitudinal direction when the web 20a or 20'a is rolled up to make the long rod for cigarettes, i.e., extend in the transfer direction of the long web 20a or 20'a of the wrapping paper transferred by the wrapping paper transfer unit 18 in this embodiment.

[0064] The burn control agent coated region forming unit 30 comprises a roller 30a and a burn control agent applying device 30b. The roller 30a is capable of contact with one surface of the long web 20a or 20'a of the wrapping paper transferred by the main portion of the wrapping paper transfer unit 18 and is rotatable in the transfer direction, and the burn control agent applying device 30b supplies a burn control agent onto the outer circumferential surface of the roller 30a and applies the burn control agent to the outer circumferential surface of the roller 30a. The roller 30a is rotated by a rotation driving source (not shown) included in the apparatus for manufacturing a burn spread suppressing cigarette shown in FIG. 1 in a rotating direction and at a peripheral speed conforming with the transfer direction and transfer speed of the long web 20a or 20'a of the wrapping paper.

[0065] The above described one surface of the long web 20a or 20'a of the wrapping paper with which the roller 30a in contact becomes an inside surface when the long web 20a or 20'a is rolled up with holding of the chopped tobacco leaves to form the long rod for cigarettes.

[0066] The burn control agent applying device 30b includes a burn control agent tank 32, a pump 34 with a control means connected to the burn control agent tank 32, and a burn control agent applying member 36. The applying member 36 is in contact with the outer circumferential surface of the roller 30a and applies the burn control agent supplied from the burn control agent tank 32 by the pump 34 with the control means onto the outer circumferential surface of the roller 30a.

[0067] The wrapping paper transfer unit 18 includes a wrapping paper position control device 18a and a wrapping paper shift unit 18b, both of which are arranged in the vicinity of the roller 30a of the unit 30. The position control device 18a controls the position of the long web 20a or 20'a relative to the outer circumferential surface of the roller 30a in the width direction of the long web 20a or 20'a of the wrapping paper. And, the wrapping paper shift unit 18b shifts the long web 20a or 20'a of the wrapping paper transferred by the wrapping paper transfer unit 18 to be brought into contact with or to be separated from the outer circumferential surface of the roller 30a, selectively. While the apparatus for manufacturing a burn spread suppressing cigarette shown in FIG. 1 is not operated, the wrapping paper shift unit 18b separates the web 20a or 20'a from the outer circumferential surface of the roller 30a, as denoted by a two dots chain line in FIG. 2. On the other hand, while the apparatus for manufacturing a burn spread suppressing cigarette, shown in FIG. 1, is operated, the wrapping paper shift unit 18b makes the web 20a or 20'a being in contact with the outer circumferential surface of the roller 30a, as denoted by a solid line in FIG. 1.

[0068] Now, the structure of the roller 30a included in the burn contract agent coated region forming unit 30 will be described in detail with reference to FIGS. 3A and 3B. FIG. 3A is a side view showing in an enlarged fashion the roller 30a, the burn control agent applying device 36, and the long web 20a of the wrapping paper transferred by the wrapping paper transfer unit 18, the roller 30a and the applying device 36 being included in the burn control agent coated region forming unit 30. On the other hand, FIG. 3B is a front view showing the roller 30a, the burn control agent applying device 36 and the web 20a, all of which are shown in FIG. 3A.

[0069] Burn control agent coated region transfer areas are formed on the outer circumferential surface of the roller 30a to correspond to the pattern and the number of the burn control agent coated regions to be formed on one surface of the web 20b or 20'b by the burn control agent coated region forming unit 30. In this embodiment, a plurality of band-shaped burn control agent coated region transfer areas 38 are formed on the outer circumferential surface and extend in the circumferential direction. The band-shaped transfer areas 38 are arranged

in the width direction to correspond to a plurality of bands 20b of burn control agent to be formed on the web 20a or 20'a to extend in the transfer direction of the web 20a or 20'a.

[0070] The number of the burn control agent coated region transfer areas 38, the width of each of the burn control agent coated region transfer areas 38, and the distance between the adjacent burn control agent coated region transfer areas 38 correspond to the number of the bands 20b of the burn control agent, the width of each of the bands 20b and the distance between the adjacent bands 20b, respectively, to be formed on one surface of the web 20a or 20'a by the burn control agent coated region forming unit 30.

[0071] The length of each of the plural burn control agent coated region transfer areas 38 can be set within the range of the length of the outer circumferential surface of the roller 30a in its circumferential direction.

[0072] FIGS. 4A, 4B, 4C and 4D show various examples of a plurality of bands of the burn control agent which are formed on one surface of the long web 20a of the wrapping paper transferred by the wrapping paper transfer unit 30, by the various burn control agent coated region transfer areas 38 on the outer circumferential surface of the roller 30a. A reference letter L shown in these Figures denotes the length of a single cigarette CG which is prepared by cutting the long rod CB for cigarettes by the cutting unit 28 in a predetermined length after the wrapping paper forming the web 20a is rolled up by the roll-up unit 23 shown in FIG. 1 to form the long rod for cigarettes.

[0073] FIG. 4A shows a plurality of bands 20b of the burn control agent formed continuously in the transfer direction of the web 20a from the leading end to the trailing end of the long web 20a of the wrapping paper. The plural continuous bands 20b of the burn control agent are obtained by continuously forming a plurality of burn control agent transfer regions 38 on the outer circumferential surface of the roller 30a in the circumferential direction.

[0074] FIG. 4B shows a plurality of groups each having a plurality of bands 20b of the burn control agent, these groups being formed intermittently with a first predetermined gap therebetween in the transfer direction of the web 20a (that is, the longitudinal direction of the web 20a of the wrapping paper after the wrapping paper is rolled up by the roll-up device 23 shown in FIG. 1 to form the long rod CB for cigarettes) between the leading end and the trailing end of the long web 20a of the wrapping paper. The distance between the adjacent two first gaps corresponds to the length 2L for two cigarettes CG.

[0075] The plural groups of the bands 20b of the burn control agent formed intermittently with the first predetermined gap of the distance Y therebetween and shown in FIG. 4B can be formed by interposing the first predetermined gap of the distance Y into the plurality of continuous burn control agent coated region transfer areas 38 for the continuous burn control agent coated regions shown in FIG. 4A at every positions located away from each other by the length 2L in the circumferential direction on the outer circumferential surface of the roller 30a, in this case the roller 30a having a circumferential length of an integral number of times as much as the length 2L for two cigarettes CG.

[0076] The distance Y between two adjacent groups of the plural bands 20b of the burn control agent in the longitudinal direction can be set freely.

[0077] FIG. 4C shows a plurality of groups each having a plurality of bands 20b of the burn control agent, these groups being formed intermittently with the first predetermined gap therebetween in the transfer direction of the web 20a, that is, the longitudinal direction of the web 20a of the wrapping paper after the wrapping paper is rolled up by the roll-up device 23 shown in FIG. 1 to form the long rod CB for cigarettes, between the leading end and the trailing end of the long web 20a of the wrapping paper. But, the distance between the adjacent two first gaps in FIG. 4C is one half of that between the adjacent two first gaps in FIG. 4B and corresponds to the length L of a single cigarette CG. Further, it is possible to section the distance corresponding to the length L into desirable more short distances.

[0078] Also, in this case, the distance Y between two adjacent groups of the plural bands 20b of the burn control agent in the longitudinal direction can be set freely.

[0079] The plural groups of the bands 20b of the burn control agent formed intermittently with the first predetermined gap of the distance Y therebetween and shown in FIG. 4C can be formed by interposing the first predetermined gap of the distance Y into the plural continuous burn control agent coated region transfer areas 38 for the continuous burn control agent coated regions 20b shown in FIG. 4A at every positions located away from each other by the length L in the circumferential direction on the outer circumferential surface of the roller 30a, in this case the roller 30a having a circumferential length of an integral number of times as much as the length L for the single cigarette CG.

[0080] Also, the plural groups of the bands 20b of the burn control agent formed intermittently with the first predetermined gap of the distance Y therebetween and shown in FIG. 4C can be formed by firstly interposing the first predetermined gap of the distance Y into the plural continuous burn control agent coated region transfer areas 38 for the continuous burn control agent coated regions 20b shown in FIG. 4A at every positions located away from each other by the length 2L in circumferential direction on the outer circumference of the roller 30a, and by secondly further interposing the first predetermined gap of the distance Y into one group of the plural firstly sectioned burn control agent coated regions 20b as described above at a center of the group in the circumferential direction of the outer circumference of the roller 30a, in this case the roller 30a having a circumferential length of an integral number of times as much as the length L of the single cigarette.

[0081] FIG. 4D shows a plurality of groups each having a plurality of bands 20b of the burn control agent, these groups being formed intermittently with a second predetermined gap therebetween in the transfer direction of the web 20a (that is, the longitudinal direction of the web 20a of the wrapping paper after the wrapping paper is rolled up by the roll-up device 23 shown in FIG. 1 to form the long rod CB for cigarettes between the leading end and the trailing end of the long web 20a of the wrapping paper. It should be noted that the second predetermined gap includes a X distance portion and a 1/2·Y distance portion. The X distance portion corresponds to a head (an end to be lighted) of the cigarette CG after the long web 20a of the wrapping paper is rolled up to form the long rod CB for cigarettes by the wrapping paper roll-up unit 23 shown in FIG. 1 and the long rod CB is cut into a plurality of cigarettes CG each having the predetermined length by the cutting unit 28. This means that the burn control agent coated regions of the bands 20b are not formed on the wrapping paper of the cigarette CG at the head of the cigarette CG by the distance X in the longitudinal direction thereof.

[0082] The distance X noted above can be set freely within a range of between about 10 mm and about 25 mm.

[0083] The 1/2·Y distance portion corresponds to an end of the cigarette CG, the end being opposite to the head (the end to be lighted) of the cigarette CG after the long web 20a of the wrapping paper is rolled up to form the long rod CB for cigarettes by the wrapping paper roll-up unit 23 shown in FIG. 1 and the long rod CB is cut into a plurality of cigarettes CG each having the predetermined length by the cutting unit 28. This means that the burn control agent coated regions of the bands 20b are also not formed on the wrapping paper of the cigarette CG at the end of the cigarette located opposite to the head thereof by the distance 1/2·Y in the longitudinal direction thereof.

[0084] In the web 20a shown in each of FIGS. 4B and 4C, the portion of the distance Y between one group of the plural bands 20b of the burn control agent and the succeeding group of the plural bands 20b of the burn control agent in the longitudinal direction provides a zone of a distance 1/2·Y on which the burn control agent is not coated, on one end portion or both end portions of the cigarette CG after the long web 20a of the wrapping paper is rolled up by the wrapping paper roll-up unit 23 shown in FIG. 1 and the long rod CB is cut into a plurality of cigarettes CG each having the predetermined length by the cutting unit 28. This means that the burn control agent coated regions of the bands 20b are not formed on one end portion or the both end portions of the wrapping paper of the cigarette CG by the distance 1/2·Y in the longitudinal direction thereof.

[0085] The 1/2·Y distance zone on which the burn control agent is not coated prevents the cutting unit 28 from coming into contact with the bands 20b of the burn control agent and from lowering the sharpness thereof when the long rod CB of wrapping paper for cigarettes is cut into cigarettes CG by the cutting unit 28.

[0086] FIG. 4E shows the cigarette CG with a filter FL in a manner that a chip paper of the filter FL is cut to open. The cigarette CG is formed by rolling up the web 20a of the wrapping paper shown in FIG. 4D to hold the chopped tobacco leaves T by the roll-up unit 23 shown in FIG. 1 to form a long rod CB for cigarettes and, then, by cutting the long rod CB into a plurality of cigarettes CG each having the predetermined length by the cutting unit 28, and the chip paper CP of the filter FL is attached to the 1/2·Y distance zone, on which the burn control agent is not coated, at the end portion of the cigarette CG located opposite to the head (the end to be lighted) thereof.

[0087] The zone of the prescribed distance X, on which the bands 20b of the burn control agent are not formed and which is located at the head (the end to be lighted) of the cigarette CG, prevents lighting of the head from deteriorating and also prevents the taste of several initial puffs of the cigarette CG immediately after the lighting from deteriorating by an influence of the bands 20b of the burn control agent. The plural groups each having the plurality of bands 20b of the burn control agent and shown in FIG. 4D are formed with the second predetermined gap having the X + 1/2·Y distance on the long web 20a, by forming each of the plurality of burn control agent coated region transfer areas 38 on the outer circumferential surface of the roller 30a as follows, the second predetermined gap providing the zone on which the plural bands of the burn control agent are not coated on the head of the wrapping paper of the cigarette CG after the long web 20a is rolled up by the roll-up unit 23 shown in FIG. 1 to make the long rod CB for cigarettes and then the long rod CB is cut into the plurality of cigarettes CG each having the predetermined length by the cutting unit 28. The plural groups of the bands 20b of the burn control agent formed intermittently with the second predetermined gap of the distance X + 1/2·Y therebetween and shown in FIG. 4D can be formed by the second predetermined gap of the distance X + 1/2·Y into the plural burn control agent coated region transfer areas 38 for the continuous burn control agent coated regions 20b shown in FIG. 4A at every positions located away from each other by the length L in the circumferential direction on the outer circumferential surface of the roller 30a, in this case the roller 30a having a circumferential length of an integral number of times as much as the length L of the single cigarette CG.

[0088] According to a principle of the present invention, each of the groups each having a plurality of bands 20b of the burn control agent and formed intermittently as shown in FIG. 4D may be further sectioned into desirable more small groups.

[0089] A structure of a modification of the burn control agent coated region forming unit 30 of the manufacturing apparatus for a burn spread suppressing cigarette shown in FIG. 1 will now be described in detail with ref-

erence to FIG. 1 and FIG. 5. And, FIG. 5 shows in an enlarged fashion the modification 30' of the burn control agent coated region forming unit 30 together with various members and mechanisms located near around the modification 30'.

[0090] The modified unit 30' for forming a burn control agent coated region includes a nozzle member 40 and a burn control agent supply device 42. The nozzle member 40 is in contact with or is positioned close to one surface of the long web 20a or 20'a of the wrapping paper transferred by the main portion of the wrapping paper transfer unit 18, and the burn control agent supply device 42 supplies the burn control agent to the nozzle member 40.

[0091] The burn control agent supply device 42 includes a burn control agent tank 42b with a pressurizing device 42a, a pump 42c, a control device 42d connected to the pump 42c, a synchronizing device 42e connected to the control device 42d, and a burn control agent transfer tube 42f which transfers the burn control agent from the pump 42c to the nozzle member 40.

[0092] A structure of the nozzle member 40 of the modified burn control agent coated region forming unit 30' will now be described in detail with reference to FIGS. 6A, 6B and 6C. Herein, FIG. 6A is a side view showing in an enlarged fashion the nozzle member 40 shown in FIG. 5, FIG. 6B is a front view showing the nozzle member 40 shown in FIG. 6A, and FIG. 6C is a side view showing an end surface of a wrapping paper facing portion 40a of the nozzle member 40 as viewed in a direction exactly opposite to the side view shown in FIG. 6A.

[0093] The wrapping paper facing portion 40a of the nozzle member 40 has a cylindrical shape and extends in parallel to one surface of the web 20a or 20'a in the width direction of the web 20a or 20'a transferred by the main portion of the wrapping paper transfer unit 18. The cylindrical wrapping paper facing portion 40a is in contact with or is positioned close to the one surface of the long web 20a or 20'a of the wrapping paper. A plurality of nozzle holes 40b are formed in the outer circumferential surface of the cylindrical portion 40a. In this embodiment, the nozzle holes 40b are arranged to correspond to the arrangement of the plurality of bands 20b of the burn control agent on one surface of the web 20a or 20'a in a width direction thereof, these bands 20b formed by the modified burn control agent coated region forming unit 30' on the web 20a or 20'a to extend in the transfer direction of the web 20a or 20'a.

[0094] The number of plural nozzle holes 40b, the diameter of each nozzle hole 40b and the distance between the adjacent two nozzle holes 40b correspond respectively to the number of plural bands 20b of the burn control agent coated regions, the width of each band 20b and the distance between the adjacent two bands 20b, these burn control agent coated regions being to be formed on one surface of the web 20a or 20'a by the modified burn control agent coated region forming unit 30'.

[0095] The synchronizing device 42e included in the burn control agent supply device 42 supplies a control signal to the control device 42d to make the control device 42d control the operation of the pump 42c. The pump 42c makes the nozzle member 40 apply the burn control agent through the plural nozzle holes 40b to the web 20a or 20'a transferred by the main portion of the wrapping paper transfer unit 18 to form a plurality of bands 20b of the burn control agent each having a desired length in the transfer direction of the web 20a or 20'a on a portion of the web 20a or 20'a of the wrapping paper. The portion of the web 20a or 20'a corresponds to the cigarette CG which is formed by rolling up the web 20a or 20'a together with the chopped tobacco leaves by the roll-up device 23 to form the long rod CB for cigarettes and, then, by cutting the long rod CB into the cigarettes CB by the cutting unit 28, in the manufacturing apparatus for a burn spread suppressing cigarette shown in FIG. 1. And, the desired length of the bands 20b is set on the basis of the longitudinal length of each cigarette CG.

[0096] The synchronizing device 42e may use an encoder mounted to, for example, the guide or support roller included in the wrapping paper transfer unit 18.

[0097] The control device 42d controls the operation of the pump 42c in synchronism with the transferred distance of the web 20a or 20'a corresponding to the length of one cigarette CG in the wrapping paper transfer unit 18, the transferred distance of the web 20a or 20'a being detected by the synchronizing device 42e and being informed from the device 42e to the control device 42d. As a result of this, the nozzle member 40 can form the plurality of desired bands 20b of the burn control agent on one surface of the web 20a or 20'a by applying the burn control agent through the plural nozzle holes 40b, as shown in, for example, FIG. 6B.

[0098] The modified burn control agent coated region forming unit 30', as in the case of using the roller 30a of the burn control agent coated region forming unit 30 described previously with reference to FIGS. 2 and 3, can also form various kinds of patterns of the burn control agent coated regions including the plural bands of the burn control agent shown in FIGS. 4A to 4D on the long web 20a or 20'a of the wrapping paper.

[0099] Various kinds of substances that can be used as the burn control agent are known in the art and includes, for example, proteins such as gelatin, casein, albumin, and gluten; polysaccharides each performing a thickening function such as starch, xanthane gum (echo gum), locust bean gum, guar gum (guar pack), tragacanth gum, tara gum, tamalindo seed polysaccharides (glyroid), karaya gum, gum arabic, pulran, dextrin, cyclodextrin, (oligoseven), and gutty; polysaccharides performing a gelling function such as carrageenan, curdlan, agar, gelatin, farselran, pectin, jeram gum, and kelco gel; lipids such as lecithin; natural high molecular weight derivatives such as carboxymethyl cellulose

(CMC), methyl cellulose (MC), propylene glycol alginate ester (PGA), and a processed starch such as starch phosphate; synthetic high molecular weight compounds such as poly (sodium acrylate) and various high molecular weight emulsifying agents; inorganic ammonium salts such as ammonium chloride, ammonium hydrogen phosphate, ammonium dihydrogen phosphate, ammonium bromide and ammonium sulfate; inorganic hydroxides such as barium hydroxide, calcium hydroxide, and aluminum hydroxide; and inorganic salt flame retardants such as sodium borate, boric acid, zinc chloride, magnesium chloride, calcium chloride and sodium sulfate. These combustion control agents can be used singly or in the form of a mixture of at least two kinds of these combustion control agents.

[0100] The inspecting unit 11 which is used for inspecting a wrapping paper for a burn spread suppressing cigarette and which has a novel structure in the manufacturing apparatus for manufacturing a burn spread suppressing cigarette shown in FIG. 1, will now be described in detail with reference to FIGS. 7 to 9 in addition to FIG. 1.

[0101] In FIGS. 7 to 9, FIG. 7 is a side view schematically showing a structure of the inspecting unit 11 which inspects a wrapping paper for a burn spread suppressing cigarette; FIG. 8A is a plan view schematically showing how the cigarette wrapping paper inspecting unit shown in FIG. 7 inspects a plurality of bands 20b of a burn control agent formed on the long web 20a or 20'a of the wrapping paper transferred by the wrapping paper transfer unit 18 shown in FIG. 1, the bands formed by the manufacturing apparatus 10 shown in FIG. 1 for a burn spread suppressing cigarette; FIG. 8B shows results of inspection performed as shown in FIG. 8A by the inspecting unit 11 which inspects the wrapping paper for a burn spread suppressing cigarette; and FIG. 9 shows results of various inspections that can be performed by the cigarette wrapping paper inspecting unit 11 shown in FIG. 7.

[0102] As shown in FIG. 7, the inspecting unit 11 which inspects a wrapping paper for a burn spread suppressing cigarette includes a light source 50 and a light intensity detecting device 52. The light source 50 is positioned to face one surface of the long web 20a or 20'a of the wrapping paper transferred by the wrapping paper transfer unit 18 shown in FIG. 1, on the one surface of which a desired pattern of the plurality of bands 20b of the burn control agent are formed by the manufacturing device 10 which is shown in FIG. 1 and manufactures a wrapping paper for a burn spread suppressing cigarette. And, the light intensity detecting device 52 is positioned to face another surface of the web 20a or 20'a opposite to the above described one surface thereof and detects the intensity of the light projected from the light source 50 and transmitted through the web 20a or 20'a.

[0103] The light source 50 is a line-shaped lighting device extending in a direction perpendicular to the transfer direction of the long web 20a or 20'a of the wrapping paper transferred by the wrapping paper transfer unit 18. In other words, the line-shaped lighting device forming the light source 50 extends in the width direction of the web 20a or 20'a as denoted by one-dot chain line shown in FIG. 8A so as to light the one surface of the web 20a or 20'a with a uniform intensity of illumination in the width direction of the web 20a or 20'a.

[0104] The light intensity detecting device 52 is a line sensor which is arranged in the side of the other surface of the web 20a or 20'a in symmetry with the light source 50 arranged in the side of the one surface of the web 20a or 20'a, and which extends in a direction perpendicular to the transfer direction of the long web 20a or 20'a of the wrapping paper transferred by the wrapping paper sheet transfer unit 18, i.e., extending in the width direction of the web 20a or 20a, as denoted by the one-dot chain line shown in FIG. 8A. The detecting device 52 uses a CCD (Charge Coupled Device) to detect the intensity of the transmitting light.

[0105] The line sensor acting as the light intensity detecting device 52 may be replaced with a plurality of spot sensors which are arranged in the side of the other surface of the web 20a or 20'a in symmetry with the light source 50 arranged in the side of the one surface of the web 20a or 20'a, and which corresponds to only a plurality of bands 20b of the burn control agent on the web 20a or 20'a on a line extending in the width direction of the web 20a or 20'a.

[0106] A signal processing device 54 which processes a signal outputted from the light intensity detecting device 52 is connected to the light intensity detecting device 52, and a defective article discarding device is connected to the signal processing device 54. Usually, the defective article discarding device is combined with a filter connecting device which connects a filter to the cigarette CG supplied from the cigarette manufacturing apparatus with a chip paper.

[0107] FIG. 8B shows the results of detection when the light intensity detecting device 52 detects the intensity of the light transmitting through the plurality of bands 20b of the burn control agent formed on the web 20a shown in FIG. 8A. The results of detection are shown as the outputs of the line sensor of the light intensity detecting device 52 at the positions in the width direction of the web.

[0108] As apparent from FIG. 8B, the intensity of the light is weaker in the range WB in which the web 20a is present in the width direction of the web than in the outside WO of the web 20a. The intensity of the light is further weakened in small ranges WC corresponding to the plurality of bands 20b of the burn control agent included in the range WB in which the web 20b is present.

[0109] The density of each of the bands 20b of the burn control agent corresponding to the small ranges WC can be known from the degree of output in each of the small ranges WC, the width of each of the bands 20b of the burn control agent corresponding to the small ranges WC can be known from the outputs in each of

the small ranges WC, and the number of bands 20b of the burn control agent formed on the web 20a can be known from the number of small ranges WC included in the range WB in which the web 20a is present. Further, the distribution of the plurality of bans 20b of the burn control agent in the width direction on the web 20a can be known from the distribution of the plurality of small ranges WC within the range WB in which the web 20a is present. More further, the distance in the width direction between the adjacent two bands 20b of the burn control agent formed on the web 20a can be known from the distance in the width direction between the adjacent two small ranges WC within the range WB in which the web 20a is present.

[0110] FIG. 9 shows the results of inspection in which the output from the line sensor of the light intensity detecting device 52 is converted into a binary signal by the signal processing device 54 so that various defects of the wrapping paper in respect of the coating of the burn control agent and the connecting point of the wrapping papers are judged.

[0111] In an example of the defective position, it is judged that a single band 20b of the burn control agent among a predetermined number of bands 20b of the burn control agent, which must be in a predetermined density and must be arranged in a predetermined arrangement in the width direction of the web 20a, is deviated from its predetermined position in the width direction of the web, on a basis of the output from the line sensor of the light intensity detecting device 52 along the width direction of the web.

[0112] In an example in which the coating was not applied, it is judged that a single band 20b of the burn control agent among a predetermined number of bands 20b of the burn control agent, which must be in a predetermined density and must be arranged in a predetermined arrangement in the width direction of the web 20a, was not formed (coated), on a basis of the output from the line sensor of the light intensity detecting device 52 along the width direction of the web.

[0113] In an example of the defective width, it is judged that a single band 20b of the burn control agent among a predetermined number of bands 20b of the burn control agent, which must be in a predetermined density and must be arranged in a predetermined arrangement in the width direction of the web 20a, failed to have a width of a predetermined value, on a basis of the output from the line sensor of the light intensity detecting device 52 along the width direction of the web.

[0114] Further, in an example of the defective coating amount, it is judged that two bands 20b of the burn control agent among predetermined number of bands 20b of the burn control agent, which must be in a predetermined density and must be arranged in a predetermined arrangement, failed to have densities of predetermined values, on a basis of the output from the line sensor of the light intensity detecting device 52 along the width direction of the web. In this example, one of the two defective bands 20b of the burn control agent has a density exceeding the upper threshold value of a predetermined range of the density, and it is detected by the line sensor as the sensor detects the lower limit TD of a predetermined output range corresponding to the predetermined range of the density. Also, the other defective band 20b of the burn control agent has a density failing to reach the lower threshold value of the predetermined range of the density, and it is detected by the line sensor as the sensor detects the upper limit TU of the predetermined output range corresponding to the predetermined range of the density. This means that the density of the other defective band 20b is lower than the predetermined range of the density.

[0115] In an example of a detection of a connecting point of wrapping papers, the connecting point at which the leading end of the long web 20' of the secondly supplied wrapping paper is connected by the automatic connecting device 22 to the trailing end of the long web 20 of the firstly supplied wrapping paper in the wrapping paper supply source 16 shown in FIG. 1, is detected on a basis of that all of the output levels in the connecting point at the bands 20b of the burn control agent on the web 20a and at zones out of the bands 20b on the web 20a are uniformly lower than those in points other than the connecting point at the bands 20b and at zones out of the bands 20b on the web 20a, the bands 20b must being in a predetermined density and must be arranged in a predetermined arrangement in the width direction of the web 20a.

[0116] When the signal processing device 54 has detected the above described various defects of the predetermined number of bands 20b of the burn control agent, which must be formed in a predetermined density and in a predetermined arrangement on the long web 20 or 20' of the wrapping paper, or the connecting points between the two long webs 20 and 20' of the wrapping papers on the basis of the output generated from the light intensity detecting device 52, the cigarette CG having a portion of the wrapping paper which includes each of the above described various defects or the connecting portion can be excluded from the non-defective normal cigarettes CG by the above described defective article discarding device (not shown) utilizing a structure equal to the synchronizing device 42e used in the modified unit 30' for forming a burn control agent coated region shown in FIG. 5, just after the cigarettes CG are formed by cutting the long rod CB by the cutting unit 28 shown in FIG. 1.

[0117] Needless to say, the signal processing device 54 can detect the presence or absence of each of the plurality of bands 20b of the burn control agent in the direction which is the longitudinal direction of the long web 20 or 20' of the wrapping paper when the web 20a or 20'a is rolled up to produce the long rod CB for cigarettes CG, that is, in the transfer direction of the web 20a or 20'a transferred by the wrapping paper transfer unit 18 in the embodiment shown in the drawings on the ba-

sis of the output from the light intensity detecting device 52, while the web 20 or 20' is transferred at a predetermined speed by the wrapping paper transfer unit 18.

[0118] Therefore, the length of that portion in which each of the plural bands 20b of the burn control agent is not present in the web 20a or 20'a in the direction which is to be the longitudinal direction as described above can be known from the time during which the light intensity detecting device 52 does not detect each of the plural bands 20b of the burn control agent and the transfer speed of the web 20 or 20' transferred by the wrapping paper transfer unit 18. Further, it is possible to detect the distance of a portion of the web 20a or 20'a on the portion of which the plural bands 20b of the burn control agent are not formed in the transfer direction of the web 20a or 20'a, that portion corresponding to the head of the individual cigarette CG prepared by rolling up the long web 20 or 20' of the wrapping paper to make the long rod CB for cigarettes and by cutting the long rod.

[0119] Further, it is possible to detect the specific values of the above described predetermined distance and further to detect that the above described predetermined distance is set to fall within a range between about 10 mm and about 25 mm.

[0120] Needless to say, according to an aspect of the invention, the method of manufacturing a burn spread suppressing cigarette, of the present invention, form the plurality of bands 20b of the burn control agent on the web 20a or 20'a transferred by the wrapping paper transfer unit 18 at desired intervals in the direction which is the longitudinal direction when the web 20a or 20'a is rolled up to prepare the long rod CB for cigarettes by the roll-up unit 23 such that each band 20b extends over the entire length or a predetermined length of the cigarette in a direction perpendicular to the longitudinal direction of the cigarette, as shown in FIG. 10A.

[0121] In this case, it is desirable that the plural circumferentially extending bands 20b of the burn control agent are formed on that surface of the web 20 or 20' which becomes an inner surface when the web 20 or 20' is rolled up by the roll-up device 23 to provide the long rod CB for cigarettes.

[0122] These plural circumferentially extending bands 20b of the burn control agent are formed in the burn control agent coated region forming unit 30 as shown in FIGS. 3A and 3B by forming burn control agent coated region transfer areas on the outer circumference of the roller 30a at a plurality of positions separated from each other in the circumferential direction of the roller 30a to extend along the center line of the rotation of the roller 30a. Also, in the burn control agent coated region forming unit 30' as shown in FIGS. 6A to 6C, the circumferentially extending plural bands 20b of the burn control agent are formed by shortening the ejection time for ejecting the burn control agent from the plurality of nozzle holes 40b of the nozzle member 40 onto the web 20 or 20' transferred by the wrapping paper transfer unit 18.

[0123] Further, the burn control agent coated region formed on the web 20 or 20' may be an aggregation of a large number of small dots as shown in FIG. 10B. The burn control agent coated region of the aggregation of a large number of small dots may extend on the web 20a or 20'a in a direction perpendicular to the direction which becomes the longitudinal direction when the web 20 or 20' is rolled up by the roll-up unit 23 to form the long rod CB for cigarettes, as shown in FIG. 10B. Alternatively, the burn control agent coated region of the aggregation of a large number of small dots may extend in the direction which becomes the longitudinal direction when the web 20 or 20' is rolled up by the roll-up unit 23 to form the long rod CB for cigarettes, as shown in FIG. 4E. Further, the number of the band-like burn control agent coated regions, each formed by the aggregation of a large number of small dots, may be set freely and the boundary of each of the band-like burn control agent coated regions may be unclear. Still further, the burn control agent coated regions may be formed on the web 20a or 20'a in various distributions (including the pattern and the number) other than the band-like shape.

[0124] The burn control agent coated region of the aggregation of a large number of small dots of the burn control agent allows a more precise burn control.

Industrial Applicability

[0125] As apparent from the above detailed description, the apparatus, according to the present invention, for manufacturing a burn spread suppressing cigarette by the method of the present invention for manufacturing a burn spread suppressing cigarette can manufacture a burn spread suppressing cigarette which does not scorch a combustible material at all or not scorch the combustible material heavily even if it scorch the material when the cigarette is erroneously left on the combustible material after lighting the cigarette, because heat of the burn controlled by the burn control agent is spread into the combustible material until the burn of the cigarette is ceased.

Claims

1. A method of manufacturing burn spread suppressing cigarette, **characterized by** comprising:

   a wrapping paper transfer step which transfers a wrapping paper (20a, 20'a) for a cigarette (CG);
   a burn control agent coated region forming step which forms a burn control agent coated region on the wrapping paper (20a, 20'a) transferred in the wrapping paper transfer step;
   a chopped tobacco leaf supply step which supplies chopped tobacco leaves (T) to the wrapping paper (20a, 20'a) on which the burn control agent coated regions is formed in the burn con-

trol agent coated region forming step;
a roll-up step which rolls up the wrapping paper (20a, 20'a) on which the chopped tobacco leaves (T) are supplied in the chopped tobacco leaf supply step, together with the chopped tobacco leaves (T); and
a cigarette cutting step which cuts the rolled-up wrapping paper (CB) rolled up, together with the chopped tobacco leaves (T), in the roll-up step to correspond to the longitudinal length of the cigarette (CG).

2. A method of manufacturing a burn spread suppressing cigarette, according to claim 1, **characterized in that**, in the burn control agent coated region forming step, a formation of the burn control agent coated region is performed in synchronism with a cutting operation of the rolled-up wrapping paper in the cigarette cutting step.

3. A method of manufacturing a burn spread suppressing cigarette, according to claim 1 or claim 2, **characterized by** further comprising a burn control agent coated region inspecting step between the burn control agent coated region forming step and the chopped tobacco leaf supply step, the inspecting step inspecting a distribution and density of the burn control agent coated region formed on the wrapping paper (20a, 20'a) in the burn control agent coated region forming step.

4. A method of manufacturing a burn spread suppressing cigarette, according to claim 3, **characterized in that**, in the burn control agent coated region inspecting step, a light is projected on one surface of the wrapping paper (20a, 20'a) for the cigarette (CG) after formation of the burn control agent coated region, light transmitted through the wrapping paper (20a, 20'a) for the cigarette (CG) is detected in a side of the other surface of the wrapping paper after formation of the burn control agent coated region, and the distribution and density of the burn control agent coated region formed on the wrapping paper (20a, 20'a) is inspected on a basis of intensity distribution of the transmitted light.

5. A method of manufacturing a burn spread suppressing cigarette, according to any one of claims 1 to 4, **characterized in that**, in the burn control agent coated region forming step, the burn control agent coated region is formed on that surface of the wrapping paper (20a, 20'a) which becomes an inner surface when the wrapping paper is rolled up for a cigarette (CG).

6. A method of manufacturing a burn spread suppressing cigarette, according to any one of claims 1 to 5, **characterized in that**, in the burn control agent coated region forming step, a plurality of bands (20b) of the burn control agent are formed to extend in a direction which becomes a longitudinal direction when the wrapping paper (20a, 20'a) is rolled up for a cigarette (CG).

7. A method of manufacturing a burn spread suppressing cigarette, according to claim 6, **characterized in that**, in the burn control agent coated region forming step, a plurality of band (20b) of the burn control agent are formed to extend intermittently in the direction which becomes the longitudinal direction when the wrapping paper (20a, 20'a) is rolled up for a cigarette (CG), with a predetermined gap in the longitudinal direction.

8. A method of manufacturing a burn spread suppressing cigarette, according to any one of claims 1 to 7, **characterized in that**, in the burn control agent coated region forming step, the burn control agent coated region is not formed on a portion of the wrapping paper (20a, 20'a), the portion of the wrapping paper becoming a head of the cigarette when the wrapping paper is rolled up to the cigarette (CG), and the head having a predetermined length in the longitudinal direction of the cigarette (CG).

9. A method of manufacturing a burn spread suppressing cigarette, according to claim 8, **characterized in that** the predetermined length is set within a range between about 10 mm and about 25 mm.

10. A method of manufacturing a burn spread suppressing cigarette, according to any one of claims 1 to 9, **characterized in that**, in the burn control agent coated region forming step, a roller (30a) is in contact with the wrapping paper (20a, 20'a) transferred in the wrapping paper transfer step and is rotated in the transfer direction, a burn control agent coated region transfer area (38) corresponding to the burn control agent coated region is formed on the outer circumferential surface of the roller, and the burn control agent supplied from a burn control agent applying device (36) is applied onto the outer circumferential surface of the roller by the burn control agent applying device (36).

11. A method of manufacturing a burn spread suppressing cigarette, according to any one of claims 1 to 9, **characterized in that**, in the burn control agent coated region forming step, a nozzle member (40a) is in contact with or is positioned close to the wrapping paper (20a, 20'a) transferred in the wrapping paper transfer step, a plurality of nozzle holes (40b) are formed in the nozzle member (40a), and the burn control agent is supplied to the nozzle member from a burn control agent supply device (42).

12. An apparatus for manufacturing a burn spread suppressing cigarette, **characterized by** comprising:

a wrapping paper transfer unit (18) which transfers a wrapping paper (20a, 20'a) for a cigarette (CG);
a burn control agent coated region forming unit (30, 30') which forms a burn control agent coated region on the wrapping paper (20a, 20'a) transferred by the wrapping paper transfer unit (18);
a chopped tobacco leaf supply unit (12) which supplies chopped tobacco leaves (T) to the wrapping paper (20a, 20'a) on which the burn control agent coated region is formed by the burn control agent coated region forming unit (30);
a roll-up unit (23) which rolls up the wrapping paper (20a, 20'a) on which the chopped tobacco leaves (T) are supplied from the chopped tobacco leaf supplying unit (12), together with the chopped tobacco leaves (T), to form a cigarette (CG); and
a cigarette cutting unit (28) which cuts the rolled up wrapping paper (20a, 20'a), which is rolled up together with the chopped tobacco leaves (T) by the roll-up unit (23) for a cigarette (CG), in a predetermined longitudinal length of the cigarette (CG).

13. An apparatus for manufacturing a burn spread suppressing cigarette, according to claim 12, **characterized in that** the burn control agent coated region forming unit (30, 30') forms the burn control agent coated region on the wrapping paper (20a, 20'a) in synchronism with a cutting operation of the rolled-up wrapping paper performed by the cigarette cutting unit (28).

14. An apparatus for manufacturing a burn spread suppressing cigarette, according to claim 12 or 13, **characterized by** further comprising a burn control agent coated region inspecting unit (11) which inspects a distribution and density of the burn control agent coated region formed on the wrapping paper (20a, 20'a) after formation of the burn control agent coated region on the wrapping paper (20a, 20'a) by the burn control agent coated region forming unit (30, 30') and before supply of the chopped tobacco leaves (T) performed by the chopped tobacco leaf supply unit (12).

15. An apparatus for manufacturing a burn spread suppressing cigarette, according to claim 14, **characterized in that** the burn control agent coated region inspecting unit (11) projects light on one surface of the wrapping paper (20a, 20'a) for the cigarette (CG) after formation of the burn control agent coated region, detects light transmitted through the wrapping paper (20a, 20'a) for the cigarette (CG) in a side of the other surface of the wrapping paper after formation of the burn control agent coated region, and inspects the distribution and density of the burn control agent coated region formed on the wrapping paper (20a, 20'a) on a basis of intensity distribution of the transmitted light.

16. An apparatus for manufacturing a burn spread suppressing cigarette, according to any one of claims 12 to 15, **characterized in that** the burn control agent coated region forming unit (30, 30') is arranged to be in contact with the wrapping paper (20a, 20'a) transferred by the wrapping paper transfer unit (18), and comprises a wrapping paper shift unit (18b) which selectively shifts the wrapping paper (20a, 20'a) transferred by the wrapping paper transfer unit (18) to be brought into contact with the burn control agent coated region forming unit (30, 30').

17. An apparatus for manufacturing a burn spread suppressing cigarette, according to claim 16, **characterized in that** the wrapping paper shift unit (18b) shifts the wrapping paper (20a, 20'a) to separate from the burn control agent coated region forming unit (30, 30') while the transfer of the wrapping paper (20a, 20'a) by the wrapping paper transfer unit (18) is stopped.

18. An apparatus for manufacturing a burn spread suppressing cigarette, according to any one of claims 12 to 17, **characterized in that** the burn control agent coated region forming unit (30, 30') forms a plurality of bands (20b) of the burn control agent to extend in a direction which becomes a longitudinal direction when the wrapping paper (20a, 20'a) is rolled up for a cigarette (CG).

19. An apparatus for manufacturing a burn spread suppressing cigarette, according to claim 18, **characterized in that** the burn control agent coated region forming unit (30, 30') forms a plurality of bands (20b) of the burn control agent to extend intermittently in the direction which becomes the longitudinal direction when the wrapping paper (20a, 20'a) is rolled up for a cigarette (CG), with a predetermined gap in the longitudinal direction.

20. An apparatus for manufacturing a burn spread suppressing cigarette, according to any one of claims 12 to 19, **characterized in that** the burn control agent coated region forming unit (30, 30') does not form the burn control agent coated region on a position of the wrapping paper (20a, 20'a), the position of the wrapping paper becoming a head of the cigarette when the wrapping paper is roller up to the

cigarette (CG), and the head having a predetermined length (X) in the longitudinal direction of the cigarette (CG).

21. An apparatus for manufacturing a burn spread suppressing cigarette, according to claim 20, **characterized in that** the predetermined length (X) is set within a range between about 10 mm and about 25 mm.

22. An apparatus for manufacturing a burn spread suppressing cigarette, according to any one of claims 12 to 21, **characterized in that** the burn control agent coated region forming unit (30, 30') forms the burn control agent coated region on that surface of the wrapping paper (20a, 20'a) which becomes an inner surface when the wrapping paper is rolled up for a cigarette (CG).

23. An apparatus for manufacturing a burn spread suppressing cigarette, according to any one of claims 12 to 22, **characterized in that** the transfer direction of the wrapping paper (20a, 20'a) by the wrapping paper transfer unit (18) is the direction which becomes a longitudinal direction when the wrapping paper is rolled up for a cigarette (CG), and

the burn control agent coated region forming unit (30) includes a roller (30a) that is in contact with the wrapping paper (20a, 20'a) transferred by the wrapping paper transfer unit (18) and is rotated in the transfer direction of the wrapping paper burn control agent coated region transfer area (38) corresponding to the burn control agent coated region and formed on the outer circumferential surface of the roller (30a), and a burn control agent applying device (36) which supplies the burn control agent onto the outer circumferential surface of the roller (30a) and applies the burn control agent to the outer circumferential surface of the roller (30a).

24. An apparatus for manufacturing a burn spread suppressing cigarette, according to any one of claims 12 to 22, **characterized in that** the transfer direction of the wrapping paper (20a, 20'a) by the wrapping paper transfer unit (18) is the direction which becomes a longitudinal direction when the wrapping paper (20a, 20'a) is rolled up for a cigarette (CG), and

the burn control agent coated region forming unit (30') includes a nozzle member (40a) which is in contact with or is positioned close to the wrapping paper (20a, 20') transferred by the wrapping paper transfer unit (18), a plurality of nozzle holes (40b) formed in the nozzle member (40a), and a burn control agent supply device (42) which supplies the burn control agent to the nozzle member (40a).

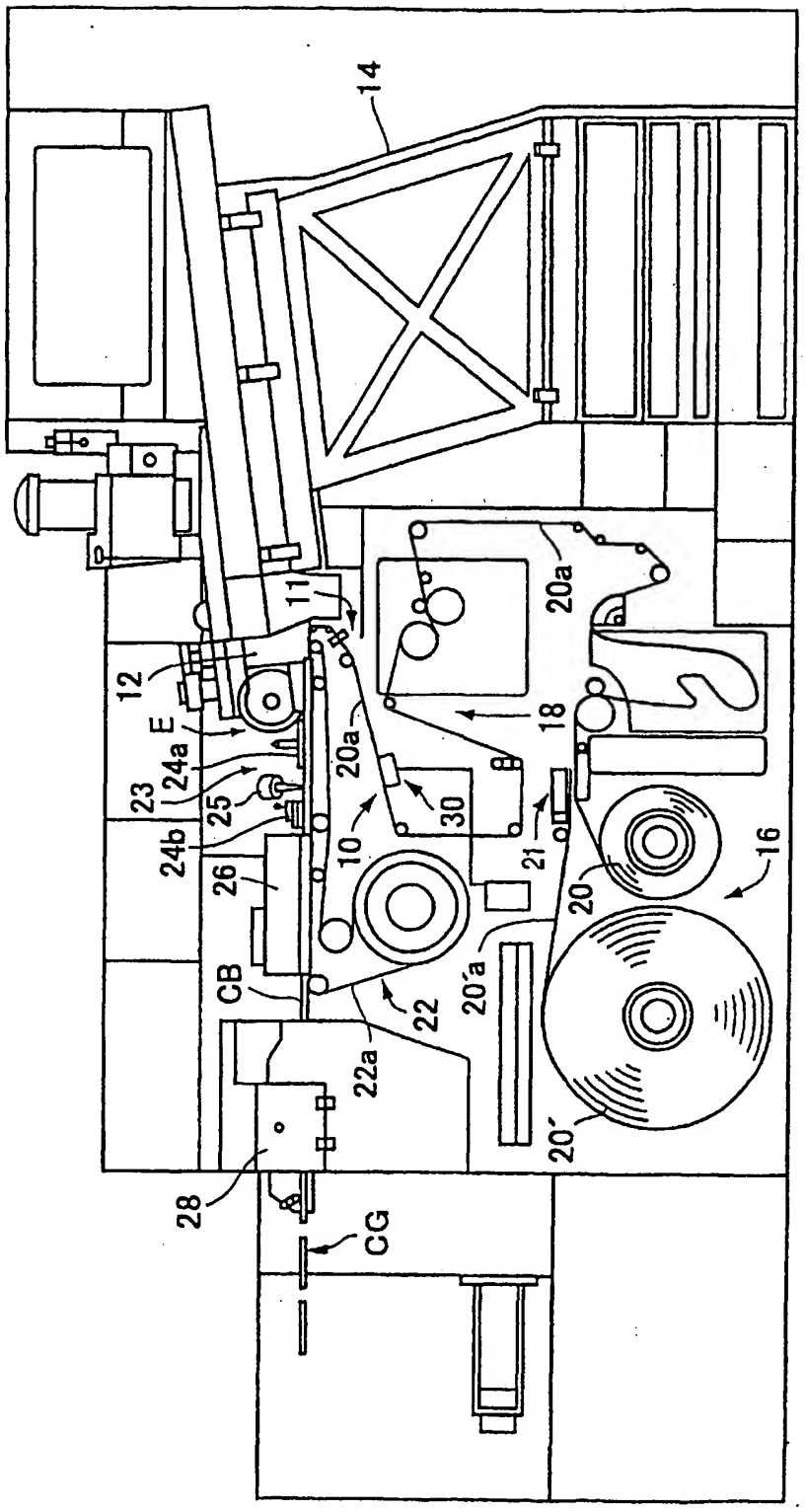
14
11
12
E
24a
23
25
24b
26
CB
28
CG
22
22a
10
20a
18
30
21
20
20'a
20'
16

FIG.1

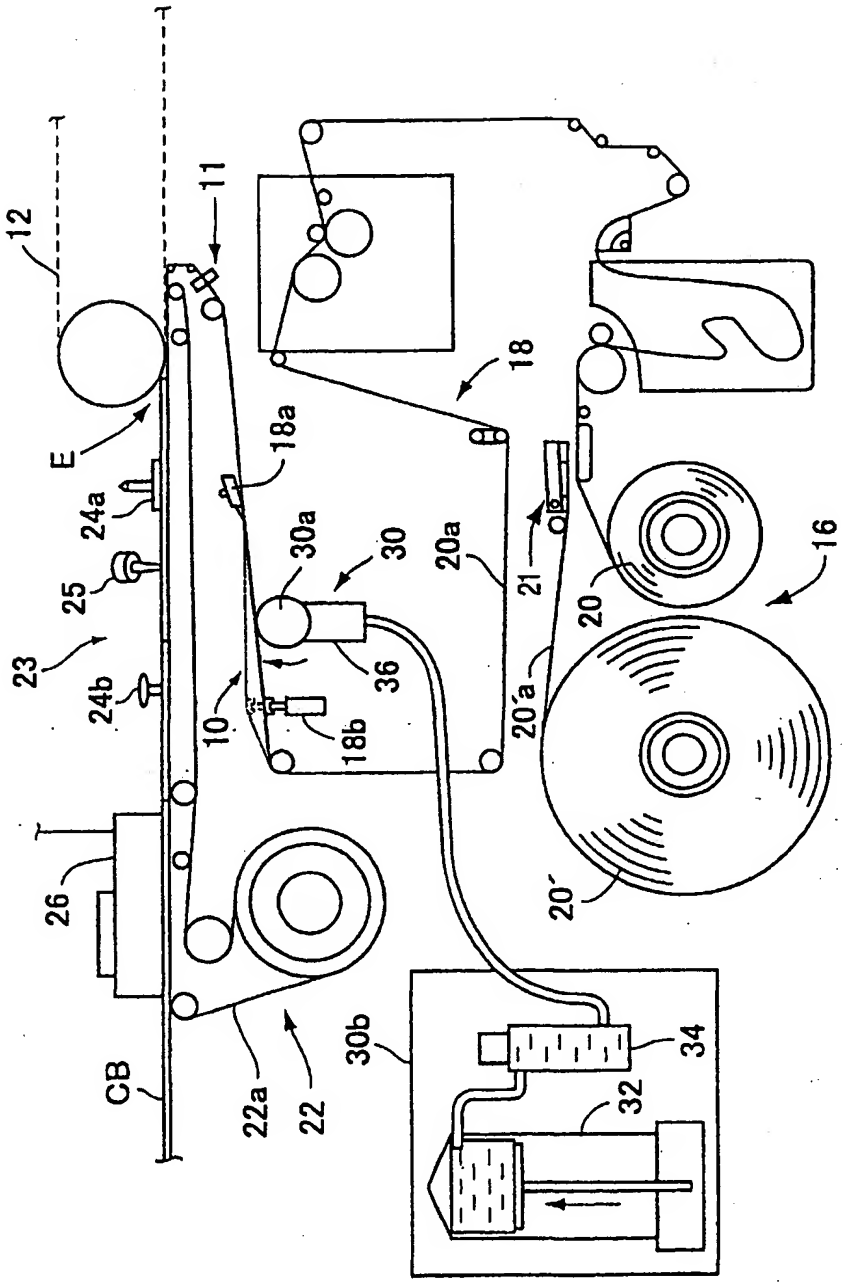
12
11
E
18
18a
24a
30a
30
20a
25
21
16
23
24b
36
20
10
18b
20'a
26
20'
CB
22a
22
30b
34
32

FIG. 2

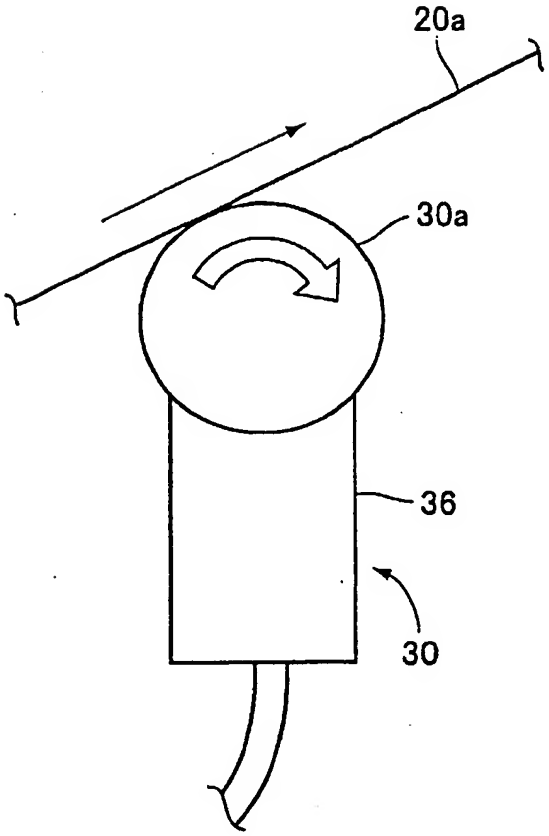

FIG. 3A

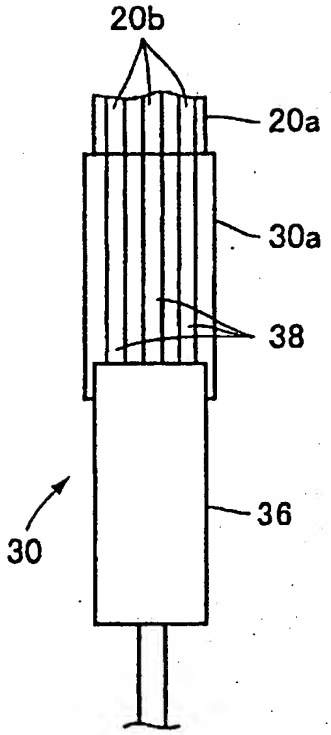

FIG. 3B

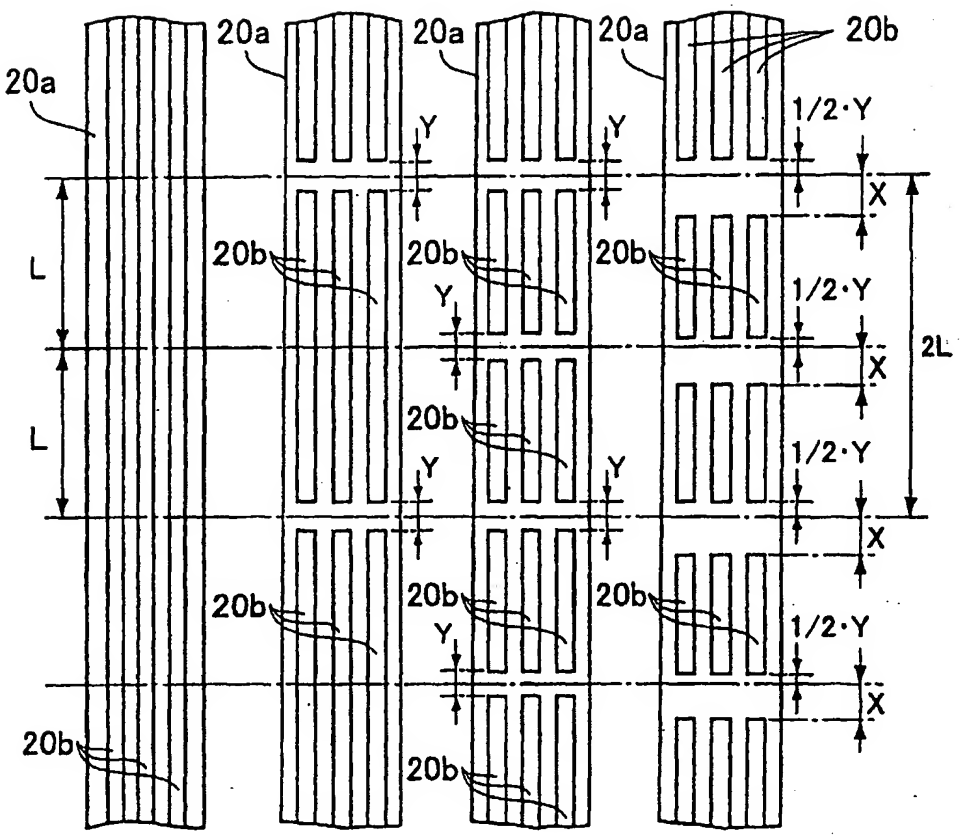

FIG. 4A FIG. 4B FIG. 4C FIG. 4D

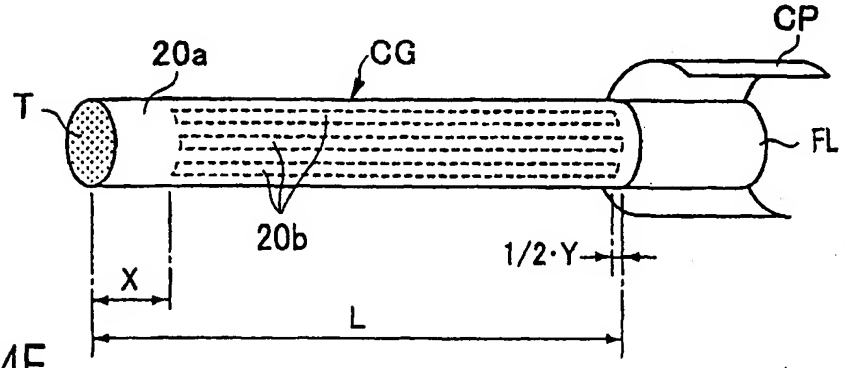

FIG. 4E

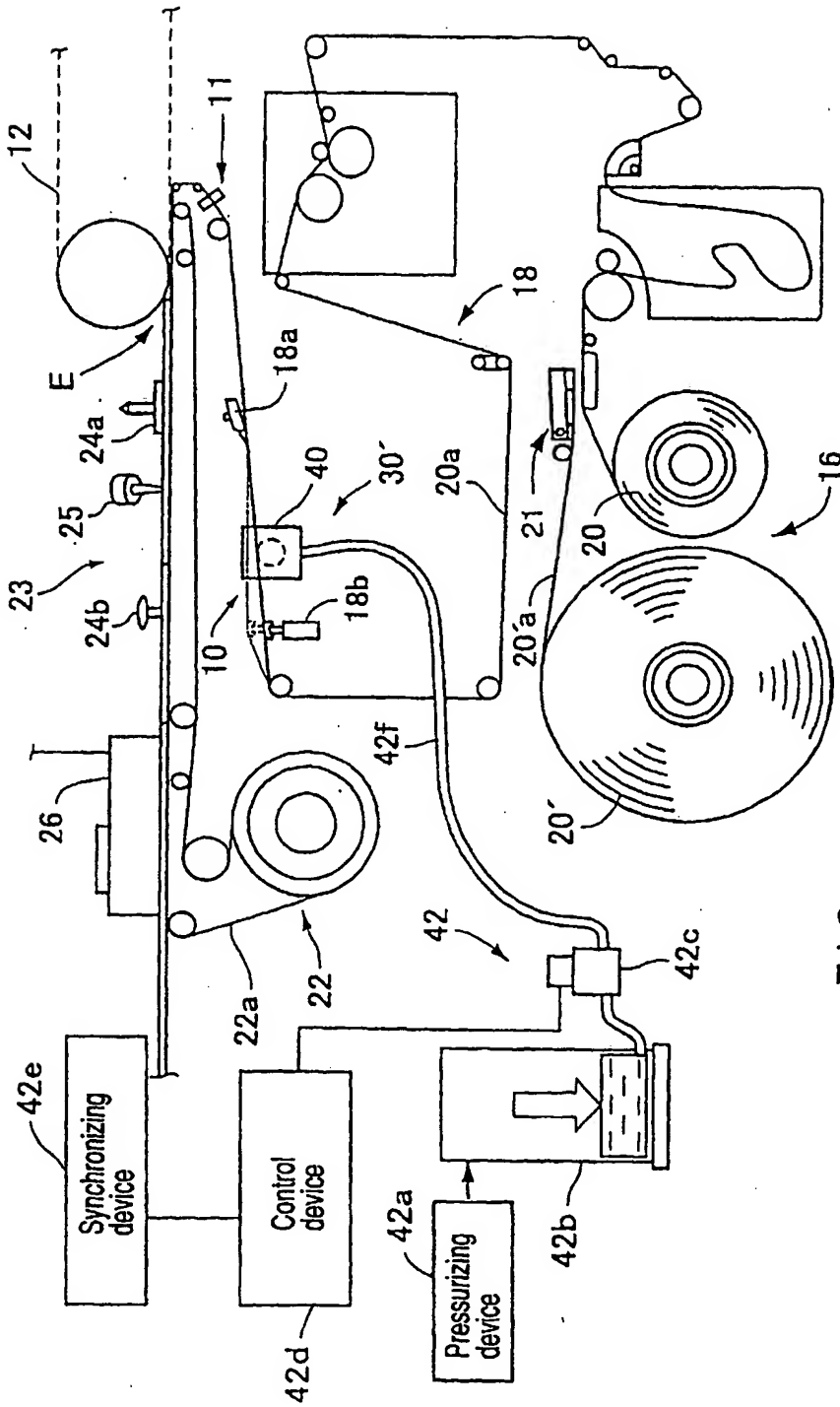
12
11
E
24a
25
23
24b
10
18a
40
30'
18b
20a
21
18
20
16
20'a
20'
26
42f
22a
22
42
42c
42e
Synchronizing device
Control device
42d
42a
Pressurizing device
42b

FIG. 5

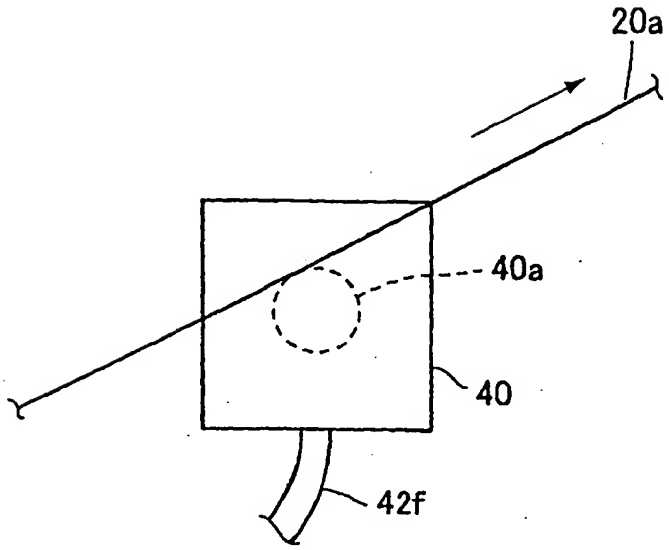

FIG. 6A

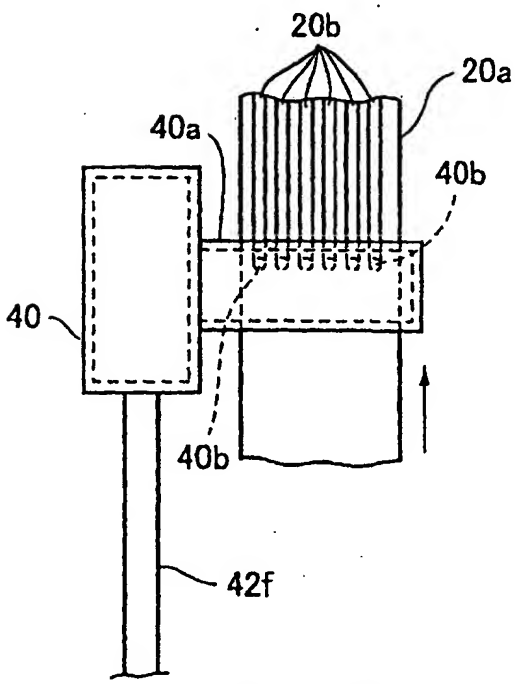

FIG. 6B

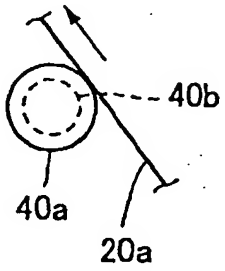

FIG. 6C

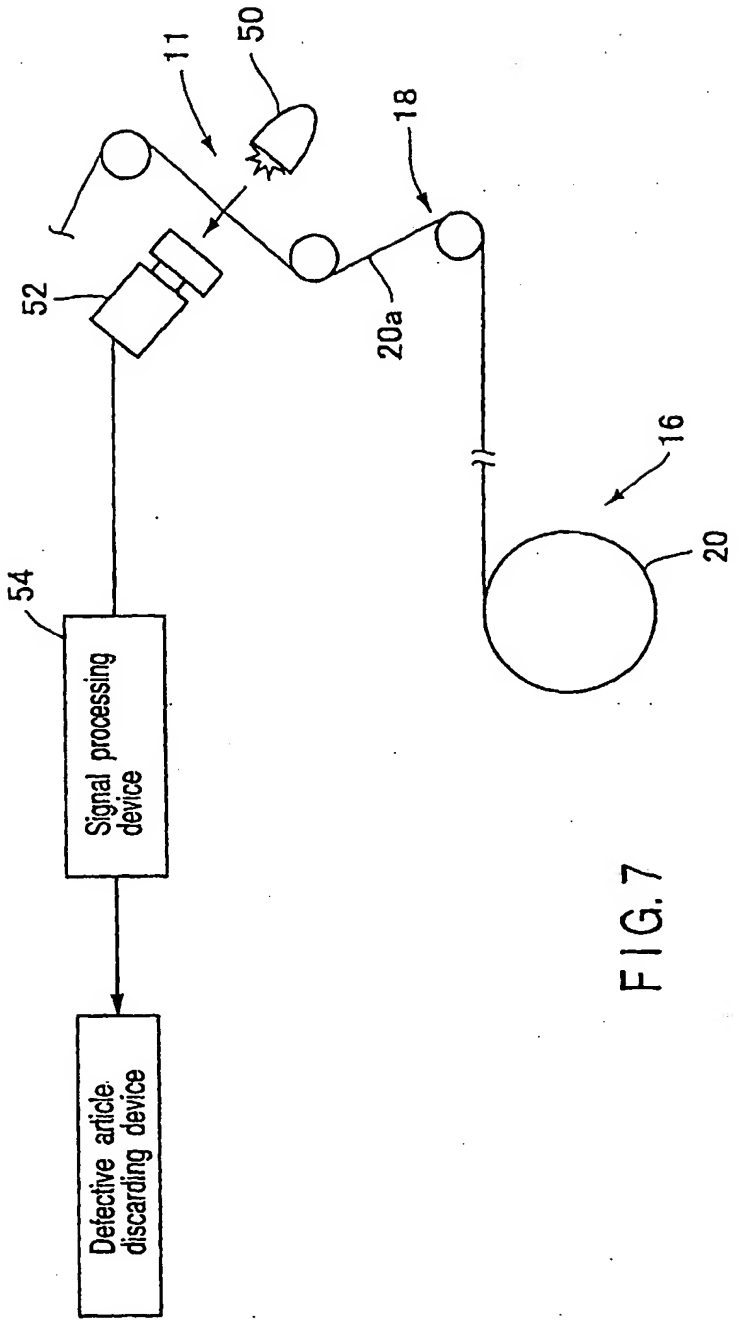
11
50
18
52
20a
16
20
54
Signal processing device
Defective article discarding device

FIG. 7

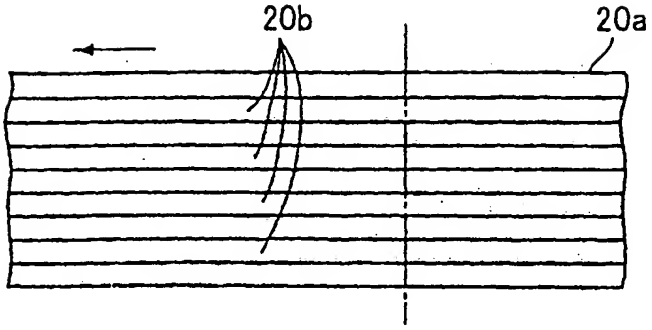
20b
20a

FIG. 8A

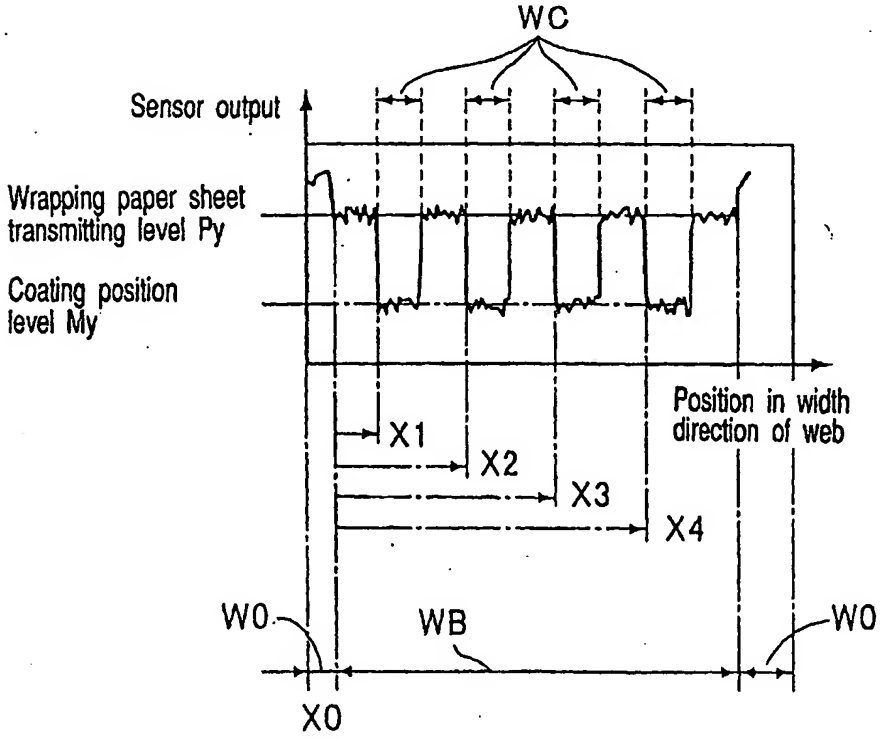
WC
Sensor output
Wrapping paper sheet transmitting level Py
Coating position level My
Position in width direction of web
X1
X2
X3
X4
W0
WB
W0
X0

FIG. 8B

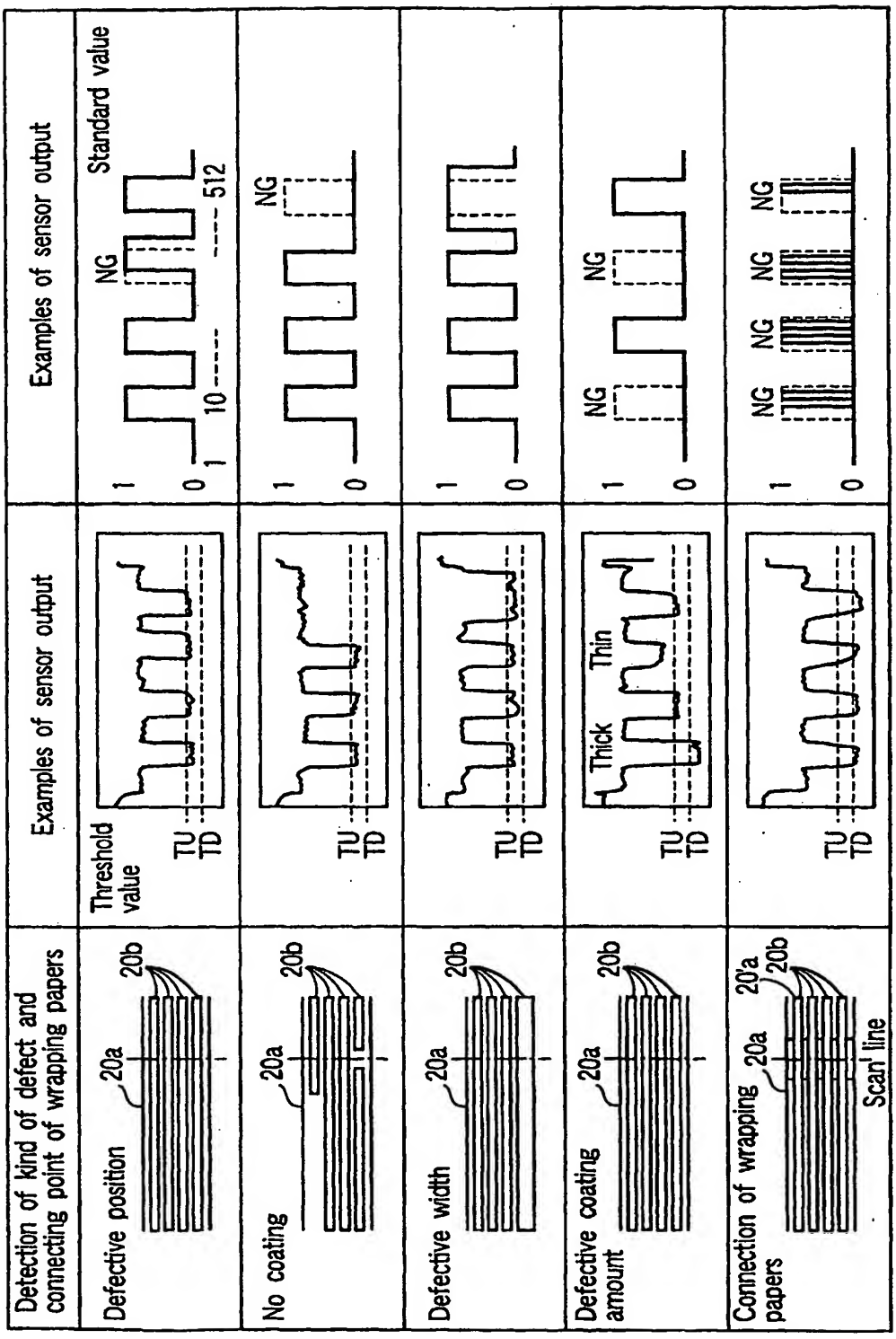
Detection of kind of defect and connecting point of wrapping papers
Examples of sensor output
Examples of sensor output
Defective position
20a
20b
Threshold value
TU
TD
1
0
1
10
NG
512
Standard value
No coating
NG
Defective width
Defective coating amount
Thick
Thin
Connection of wrapping papers
20'a
Scan' line

FIG. 9

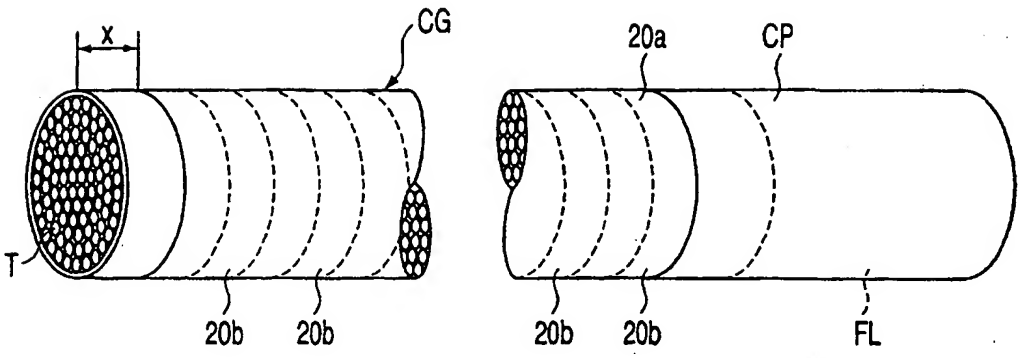

FIG. 10A

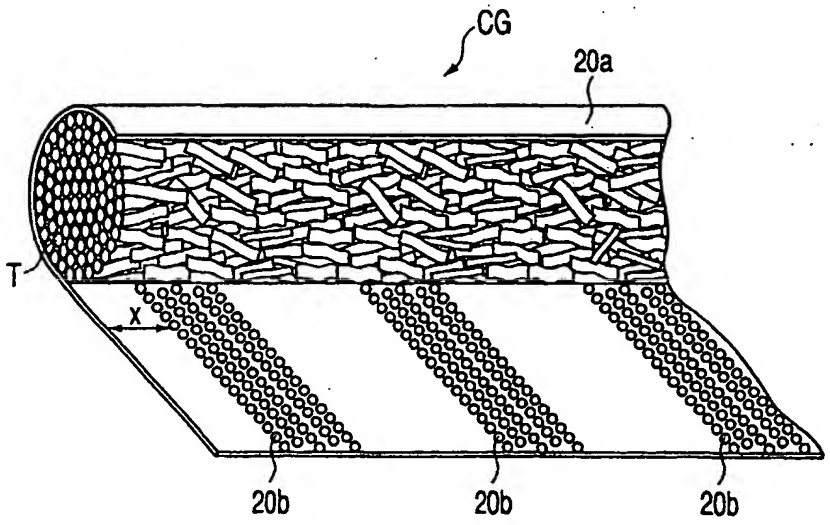

FIG. 10B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP01/07796

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] A24C5/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] A24C5/00-5/34

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2001
Kokai Jitsuyo Shinan Koho 1971-2001 Jitsuyo Shinan Toroku Koho 1996-2001

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 63-116684 A (Korber AG), 20 May, 1988 (20.05.88), & IT 1222652 B & DE 3631227 A & GB 2196829 A & US 4844100 A1	1-24
Y	JP 4-293478 A (Philip Morris Incorporated), 19 October, 1992 (19.10.92), & AU 637265 B & FI 915098 A & CA 2054219 A & NO 914243 A & EP 483998 A1 & US 5191906 A1	1-24
Y	JP 64-43177 A (Kober AG), 15 February, 1989 (15.02.89), & GB 2207594 A & CN 1030863 A & DE 3725364 A & US 4878506 A1 & IT 1226724 B	3-11,14-24
Y	JP 59-151880 A (Hauni-Werke Kober & Co. KG), 30 August, 1984 (30.08.84), & DE 3345608 A & FR 2540352 A & GB 2134368 A & US 4574816 A1 & IT 1173189 B	3-11,14-24

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 September, 2001 (21.09.01)	02 October, 2001 (02.10.01)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)